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ANCIENT MESOAMERICA

Selected Readings

John A. Graham

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"Human Sacrifice and Warfare as Factors in the Demography of Pre-Colonial Mexico," by S. F. Cook, from *Human Biology*, Vol. 18, pp. 81-102, 1946, by permission of the Wayne State University Press.

Preface

The collection of papers in this volume is intended for a class devoted to the study of pre-Columbian Mesoamerica, that portion of modern Mexico and northern Central America which witnessed the development of complex native cultures we term civilizations. The papers selected are intended to supplement and diversify coverage but not to replace texts and lectures in the course of study. In the course of making such a selection omissions of important sites, areas, periods, topics, and interpretations have inevitably occurred. To cite only two of these in terms of sites and areas, there are no papers on Teotihuacan or treating the Gulf coast "heartland" of the Olmec; fortunately, however, these are both necessarily discussed in detail in any text. A conscious attempt has been made to provide a range of readings from the semi-popular level to the fairly detailed and technical in order to illustrate and provide an awareness of the range of the literature. All compilers of readers such as this are familiar with the painful decisions of what to include, what to exclude, and what should be included but which cannot for various reasons.

With continuing and dramatic new discoveries, with the increasingly diverse array of interpretations and re-interpretations being advanced, and with the fads and fashions of processual explanation and model building, as anthropologists we are all aware of how frequently our writing is dated or even out of date by the time of publication. Nevertheless, many papers retain considerable value long after their conclusions are recognized as no longer tenable, revealing the intellectual structures of their age, an informative method of treating data, or novel insights from writers not burdened with traditional assumptions and issues difficult for scholars long enmeshed in the details of their fields to escape. All of these provide a variety of intellectual experiences for the student which cannot be gleaned from the most skillfully constructed and inspired texts and syntheses. One of the greatest values of a collection of readings is, therefore, the opportunity for a student to conveniently sample first hand the writings of various investigators, providing a

dimension of learning unattainable in a text. I have sought in this volume to provide such a core of diverse readings sampling a variety of work and thought with the added goal of providing flexibility to the instructor in designing course lectures.

It is not possible in the context of these introductory remarks to comment upon each paper in the present collection. In any case, each colleague and student will find significance and intellectual stimulation in different aspects of the papers and in accordance with their own particular interests. I will, therefore, comment only briefly upon a few of the articles to illustrate some of the thinking involved in the selection and arrangement of this collection.

The volume opens with what might be considered a classic paper reflecting the methodologies of the very early days of anthropological research. While contributing the designation now generally employed for the geographic area of our interest, Mesoamerica, Kirchhoff's procedure of drawing up trait or culture-element lists seems exceedingly naive today, particularly with the juxtaposition of traits of such disparate significance as "sandals" and "markets." One consequence of Kirchhoff's paper which I consider particularly unfortunate has been a contribution to the reification of the notion of one culture, one civilization, one Mesoamerica across the dimensions of time, language, and environmental frontiers. It will surely seem curious to some that archaeologists who have acquired sophistication in the anthropological study of culture change should so readily hold to the view of "a single unified tradition" or "one basic civilization," particularly given their familiarity with comparative world history and modern philosophies of history (to cite a current and relevant example, the *épistème* concept of Michel Foucault). The paper by George Kubler, following Kirchhoff's, provides a healthy antidote, warning of the dangers of such thinking while suggesting a wealth of stimulating insights which might be exploited in the study of the ancient cultures of Mesoamerica. The notion of "one civilization" may be compared, in an historical sense, to the period of Mesoamerican research in which it was believed that a single developmental series of cultural stages fixed in absolute chronology (as in "Preclassic, Classic, Postclassic") could be recognized throughout the area; as discussed by John Rowe (1962), the developmental stage model usually derives from a situation in which one regional sequence has been worked out in at least broad outline with less well understood regions having their archaeological complexes pigeonholed in terms of the "master sequence."

The following papers by Coe and Flannery (Article 3) and by Sanders (Article 4) emphasized the importance of the diverse ecological settings and their possible consequences in the interpretation of early Mesoamerican civilization. In contrast, Aveleyra's paper (Article 5) provides a straightforward, excavator's account of the investigation of Pleistocene faunal remains found in association with the tools of early hunters. It is a classic description, and since the historic discoveries at Santa Isabel Iztapan in the Basin of Mexico similar or related discoveries have been made in distant sectors of Mesoamerica, from elsewhere in the highlands to the tropical lowland environments. As finds such as these continue to accumulate, we are gradually beginning to formulate a broader and fuller, if still far from complete, picture of the early human history in Mesoamerica.

MacNeish's (Article 6) influential account of his reconstruction of cultural development from terminal Pleistocene man to settled life in the Tehuacan valley of southern Puebla has served as a model for this epoch for many

years, and it was previewed by Coe and Flannery (Article 3) in the context of their examination of microenvironments in a small sector of Pacific coastal Guatemala. It has been recognized, of course, that a developmental model formulated upon the Tehuacan valley was scarcely likely to be typical of other Mesoamerican environments, particularly those which made far more significant cultural-historical contributions to the development of Mesoamerican civilization. Therefore, Niederberger's (Article 7) interpretations of her excavations in the Valley of Mexico constitute a fascinating and stimulating comparison to the Tehuacan model.[1] MacNeish himself (MacNeish *et al.* 1980) is currently uncovering still another alternative sequence of development from early man to sedentary life in coastal Belize in the Maya lowlands, an area previously characterized by many archaeologists as uninhabited until comparatively late periods.

Just as some traditionally held views of Mesoamerican subsistence patterns are being radically altered by new discoveries and more sophisticated, less biased research, with the profoundest ramifications in the interpretation of Mesoamerican culture history, so has the nature of one of the most prominent aspects of native life, namely religious systems, come into question and renewed scrutiny. Thompson (Article 16), who never doubted the existence of multitudinous Maya "gods," notes the apparent absence of "idols" among the "Chol Maya," while Tatiana Proskouriakoff (1965:479-471) later questioned the identification of grotesques in Classic Maya art as "deities" and has speculated upon the possible absence of personalized dieties among the earlier Maya. Marcus (Article 23) continues this general line of inquiry in her comparison of Maya and Zapotec religious patterns not only traditionally accepted but even elaborated upon by archaeologists in their close adherence to colonial Spanish views and misconceptions of native sacred ritual. Troike (Article 22; see also her 1980:143-144) similarly raises the issue of the nature of Mixtec "deities" in her outlining of the new directions current studies of the Mixtec pictorial manuscripts are now taking. Most of these writers pose warnings against the uncritical imposition of an "Aztec model" of divinities upon other cultures and peoples, which intellectually harkens back to Kubler's (Article 2) remarks on Panofsky's analysis of disjunction, the severance of form and meaning and their reassemblies, a concept which extends to cultural behaviors even beyond the realm of art. That the traditional "Aztec model" of religious life is itself not as healthy as has been thought was made evident by Hvidfeldt (1958) whose insights into Aztec cult images and their regalia have generally been overlooked in the context of his flawed and outdated general theory of cult and myth. Hvidfeldt's investigations have been elaborated upon recently by Townsend (1979: 23-36).

Lest the student feel that Thompson (Articles 15 and 16) has fully mined and summarized the ethnohistorical sources for the "Chol Maya" and the Itza, it is worth noting that new, previously inaccessible data continue to appear, to wit the recent publication of Nicolás de Valenzuela's important *entrada* (von Houwald 1979). Similarly, Brigitte Stehlik (1981) has recently completed a study of colonial Spanish sources on the Lacandon area west of the Usumacinta, including Dolores del Lacandón in 1965, and has concluded, convincingly I believe, that contrary to Thompson and almost all other writers, the predominate linguistic affiliation of the population here in the 16th and 17th centuries was closer to Yucatec. Calnek's (Article 25) paper on Tenochtitlan well exemplifies the highest standards of modern ethnohistorical research.

It must seem almost unbelievable to modern students to find that for many decades leading Maya scholars held the view that the realistic portrayals of elaborately costumed figures in Maya art represented not historic rulers but anonymous priests or deity impersonators while their accompanying hieroglyphic legends did not identify the figures or extol their histories but rather were given over to "a mystical philosophy of time." Earlier explorers of Maya ruins had seldom doubted the true nature of these art works, but it was not until the work of Tatiana Proskouriakoff (Article 18; see also her 1960 paper) and Heinrich Berlin (1958 and 1959) that the old myth fabricated by scholars fully crumbled. The short paper by Mathews and Pendergast (Article 19) conveniently illustrates the directions current research is taking.

Caso's paper (Article 21) is another historic or period piece which provides an account of the discovery of the most spectacular tomb yet found by archaeologists working outside of the Maya region in Mesoamerica. Aside from the excitement of this dramatic find, the article illustrates the thinking of his age by a major figure in Mesoamerican research. The errors of Caso's interpretations are set into perspective by Troike's (Article 22) outline of the current re-working of Mixtec ethnohistory and by Nicholson's (Article 20) discussion of the Mixteca-Puebla complex. A final period paper closes the present collection: Cook's (Article 27) attempt to quantify the extent of human sacrifice among the Aztec and to relate it to demography. In a sense this paper marks a preliminary step toward the recent and continuing controversy regarding the nature and possible dietary significance of Aztec cannibalism (Harner 1977; Harris 1977; Price 1978, among various rejoinders).

All royalties that may accrue from the sale of this book are paid by the publisher to the Archaeological Research Facility of the University of California, Berkeley, for the establishment of an "Ancient Mesoamerica Fund" for the support of archaeological research and student scholarship in Mesoamerican studies.

John A. Graham

A Chronology of Ancient Mesoamerica

Basic Epochs	*Traditional Classifications*	*Basin of Mexico Seminar* [2]
Late Period (AD 1000+)	Post-Classic Stage/Period (usually AD 900+)	Late Horizon ("Aztec") (AD 1325-1521)
		Second Intermediate (AD 750-1325)
Middle Period (AD 1-1000)	Classic Stage/Period (usually ca. AD 300-900)	Middle Horizon ("Teotihuacan") (AD 200-750)
		First Intermediate (800 BC - AD 200)
Early Period (300 BC-AD 1)	Pre-Classic or Formative *Stage/Period* (usually ca. 1500 BC-AD 300)	Early Horizon ("Olmec") (1300-800 BC)
		Initial Ceramic (2500-1300 BC)
Initial Period (?-3000 BC)	Various terms, including Archaic, Hunters-Gatherers, Lithic, etc.	Lithic (30,000-2500 BC)

Notes

1. These remarks are cognizant of MacNeish's recent criticism of the Zohapilco interpretations (MacNeish 1981:951-953); for an alternative to MacNeish's interpretation of band organization and hunting in the earliest Tehuacan phases, see Flannery 1966:800-805).
2. Price 1976; Millon 1976.

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Contents

1

MESOAMERICA: Its Geographic Limits, Ethnic Composition And Cultural Characteristics

by Paul Kirchhoff

In the geographic classifications of the native cultures of America which take in the whole Continent or which at least deal with a particular region from a continental point of view, one may easily distinguish two types.

In the first of these, one accepts one or the other of the usual divisions of the American Continent, based on political geography or biogeography. Most Americanists either divide the Continent simply into North and South America, or interpose between the two parts a third, whether it be "Mexico and Central America" or, as some American (U.S.) anthropologists call it, "Middle America." In the first case, as a general rule, one accepts as the boundary between North and South America, the biogeographical dividing line which follows the course of the San Juan River, between Nicaragua and Costa Rica. In the second case, one includes in "Mexico and Central America" all the territory between the northern frontier of the Mexican Republic and the eastern border of Panama; in "Middle America" the same region, excluding at times the north of Mexico, including at times the Antilles.

Both divisions and their variants which we have noted here have serious drawbacks when they are used for anything more than a mere geographic localization of cultural phenomena of the native world, or in order to set the geographic limits for programs of investigation or publication. The biogeographic boundary between North and South America, although it coincides with a local boundary between regions with clearly marked cultural characteristics, nevertheless does not constitute a cultural boundary between North and South America, inasmuch as to the north of it; the culture of the Sumo and the Misquito and even that of the Paya and Jicaque, is just as "South American" as that of the Chibcha of Central America. In reality, this term

lacks any precise meaning, since in South America, whatever the extension we wish to give to the term may be, there are cultures as different one from another as those of the Fuegians, the Caribs,. and the Inca. On the other hand, the remaining cultures of Central America and Mexico do not give evidence of any "North American" characteristics, but, on the contrary, perhaps have more in common with certain cultures of South America than with any of North America. Actually, their similarities to certain North American cultural areas, such as those of the Southeast and in part of the Southwest of the United States, are evidenced in large measure in traits which both have in common with certain cultural areas of South America.

The drawbacks of the triple division mentioned are perhaps even greater. Neither the aggregate of the republics of Mexico and Central America, nor "Middle America" in any of the senses just mentioned, constitutes for the anthropologist a region which stands out from the other cultures of the Contient, and which therefore merits especial study. In fact, those who accept one or the other of these triple divisions, far from considering "Mexico and Central America" or "Middle America" as a cultural unit—opposed as such to North or to South America—continue to recognize as basic the division between North and South America, assigning certain cultures of this region to North America and others to South America.

The second type of geographic classification groups the native American cultures in five large areas:

1. The food-gatherers, hunters and fishers of North America.
2. The interior cultivators of North America.
3. The superior cultivators ("High Cultures").
4. The inferior cultivators of South America.
5. The food-gatherers and hunters of South America.

The anthropologists who accept this type of division, which, like the previous one, has many variants which we do not mention, recognize either explicitly or implicitly that within the areas of the so-called superior cultivators are included, by way of exception, individual tribes or even whole cultural areas which cannot be considered superior cultivators, neither with respect to their general cultural level, nor with respect to plants and techniques of cultivation. In the same way, at times food-gatherers and hunters are included in the areas of the inferior cultivators.

Their inclusion within the areas of superior culture is justified by the fact that notwithstanding their lower cultural level, they share with the other tribes of the area in which they are included a considerable number of cultural traits; whether this be due to the fact that these tribes have been left behind by the more advanced tribes, thus preserving a part of the old common culture, or to recent cultural diffusion. This point of view leaves their individuality to the cultural areas (in the sense of a group of tribes with cultures which are not merely superficially similar, but are fundamentally alike) and allows one at the same time to group them in "superareas" and subdivides them into "subareas." Within the area of the inferior cultivators of North America, the "Southeast" and the "Southwest" (in the sense of "The Greater Southwest" or "Arid North America") constitute such superareas; and within the area of the superior cultivators one can mark out a superarea "Mesoamerica" whose geographic limits, ethnic composition and cultural characteristics at the time of the Conquest, we propose to study in this article.

The present work is based on a series of studies of distribution initiated by the International Committee for the Study of Cultural Distribution in America, created by the XXVIIth International Congress of Americanists. Although these studies are still far from being complete, it is already possible to present certain general outlines for

the purpose of posing new problems. This aim of our article has made unnecessary the inclusion of notes or bibliography.

Geographic Limits and Ethnic Composition

On the basis of the studies mentioned above, one may postulate that at the time of the Conquest, there were present in Mesoamerica a series of tribes which we may group in the following five divisions:

1. Tribes which speak languages not yet classified, such as the *Tarascan*, the *Cuitlatec*, the *Lenca*, etc.
2. All the tribes of the *Maya, Zoque*, and *Totonac* linguistic families. According to certain investigators, the languages of these three families, to which one should probably add the *Huave*, form a group which we might call *Zoque-Maya* or *Macro-Mayan*.
3. All the tribes—except two—of the *Otomi, Chocho-Popoloca* and *Mixtec* families, which seem to form, together with the *Chorotega-Mangue* family, a group called *Otomangue*; and all the tribes of the *Trique, Zapotec* and *Chinantec* families, which some investigators consider related to the previous group, forming a great group called *Macro-Otomangue*.
4. All the tribes of the *Nahua* family and a series of other tribes of *Uto-Aztecan* affiliation, among them the *Cora* and the *Huichol*, whose grouping in families is still not definitive.
5. All the tribes of *Tlappanec-Subtiaba* and *Tequistlatec* families which belong to Sapir's *Hokan* group.

An analysis of the ethnic composition of Mesoamerica, at the time of the Conquest, shows the following:

a. Of all the linquistic families which form part of Mesoamerica, only one, the *Otomi*, has some members (the *Pame* and the *Jonaz* which are perhaps only subdivisions of a single tribe), which do not belong to the Mesoamerican cultural unit.
b. Two linguistic groups, formed by some of these families, the *Zoque-Maya* and the *Macro-Otomangue*, should their reality be demonstrated, would be found to be entirely within Mesoamerica.
c. Tribes of these two groups, and also of the *Nahua* reach, probably as a result of migrations, to the farthest geographic limits of Mesoamerica, both in the North (of the *Zoque-Maya* group, the *Huastec*; of the *Macro-Otomangue*, the *Otomi*; and of the *Nahua* family, the *Cazcan* and the *Mexicans*) and in the South (of the *Zoque-Maya* group, the *Chol-Chorti*, of the *Macro-Otomangue*, the *Chorotega*, and of the *Nahua* family, the *Nicarao*).

All of this shows the reality of Mesoamerica as a region whose inhabitants, both the very old immigrants and the relatively recent ones, were united by a common history which set them apart as a unit from other tribes of the Continent, their migratory movements being confined as a general rule, once they had entered the area of Mesoamerica, within its geographic limits. In some cases tribes of different families or linguistic groups took part in these migrations together.

In spite of the fact that it had linked its fate firmly to that of Mesoamerica, the *Nahua* family, both because it had many linguistic relatives, more or less close, outside of Mesoamerica, and in view of its traditions concerning one or a number of migrations from the North, shows itself to have played, within our area, a cultural role very different from that of the linguistic families listed under "2." These, like the

tribes not yet linguistically classified, seem to lack linguistic relatives within any reasonable distance of Mesoamerica, which leads us to believe that they both, i.e., the *Maya, Zoque, Totonac, Tarascan, Cuitlatec*, etc., not only have lived for a long time within the territory occupied by the cultural aggregate of Mesoamerica, but that they have perhaps played an important part in the very process of its formation.

The *Marco-Otomangue* group, or at least its *Otomangue* sub-group composed of the *Otomi*, *Chocho-Popoloca*, *Chorotega* and perhaps the *Mixtec* families, in spite of its dissemination within the territory of Mesoamerica, does not give us the impression that it is equally deep-rooted or that it has played as important a role in the formation of Mesoamerica as the *Zoque-Maya* group, but it seems more probable that it entered the Mesoamerican orbit when the area already existed as a cultural unit. Tribes of these families not only appear curiously associated in their geographic distribution with *Nahua* tribes (almost as in South America, and the Antilles, the Arawak with the Caribs), but in several cases we also have historical traditions concerning common migrations of the Toltecs of *Nahua* speech with *Otomi* peoples (according to Sahagún), or with *Mazatec, Popoluca* and *Otomi* (according to the *Historia Tolteca-chichimeca*), and of the *Nicarao* with the *Chorotega* (according to Torquemada). Furthermore we have on the one hand traditions about a migration of the Otomies from the northwest (according to Ixtlilxochitl) and on the other the fact that the *Pame* and the *Jonaz* live to this day outside the Mesoamerican territory, immediately to the north of it.

The numerical and geographical isolation which we find in the *Tlappanec-Subtiaba* and *Tequistlatec* families at the time of the Conquest, suggests that the role that they played in the history of Mesoamerica either was never very important, or goes back to a very distant past; unless one must consider them as relatively recent immigrants to a Mesoamerica already formed.

The proper estimation of the role of each linguistic family or group in the history of Mesoamerica, together with the solution of the problem of determining since when a cultural superarea has existed and what has been its geographic extension, and what its cultural foci have been in different periods, presupposes, in addition to the completion of the already begun studies of cultural distributions at the time of the Conquest, the carrying out of similar studies for different pre-Columbian periods; the utilization of both of these types of studies for the division of Mesoamerica into subareas which will be different in number and extension for different periods; and more excavations in regions which at the time of the Conquest were outside of Mesoamerica, but which in previous times formed part of it, such as have been carried out in a broad zone in the north of Mexico, occupied at the time of the Conquest by tribes of inferior culture.

What we can already assert at this time is that the northern frontier of Mesoamerica was distinguished from the southern boundary by a much greater degree of mobility and insecurity, with alternating periods along it of expansion northward and retraction toward the south. The periods of retraction are due in part to invasions of groups of lower culture situated to the north of Mesoamerica.

This difference between the frontiers to the north and the south, as well as the differences existing between various sections of each of the boundaries, are due, at least in part, to the fact that Mesoamerica is the last link to the north in the chain of superior cultivators. Actually, only in a short section of the southern frontier did Mesoamerica, at the time of the Conquest, border on another area of superior cultivators (the *Chibcha*), while along the rest of this frontier its neighbors were inferior cultivators (the *Jicaque* and *Paya* and the *Sumo* and *Misquito*). In the northern frontier the situation was even more unfavorable, since with the exception of two quite

short sections, one in Sinaloa and another insignificant one on the coast of the Gulf, where its neighbors were inferior cultivators, Mesoamerica bordered directly on food-gatherers and hunters.

At the time of the Conquest, the last tribes of Mesoamerican culture on the southern bondary (which runs, more or less, from the mouth of the Motagua River to the Gulf of Nicoya, passing through Lake Nicaragua) were the *Chol-Chorti*, the *Lenca* (and perhaps the *Matagalpa*), the *Subtiaba*, the *Nicarao* and the *Chorotega-Mangue*; on the northern boundary (which runs more or less from the Rio Panuco to the Sinaloa, passing along the Lerma), the *Huastec*, the *Mexicans* of Meztitlan, the *Otomi* and *Mazahua*, the *Tarascan*, the *Coca*, the *Tecuexe*, the *Cazcan*, part of the *Zacatec* (there were *Zacatec* who were food-gatherers and hunters), the *Tepehuan*, the *Acaxé* and the *Mocorito*. Although the southernmost tribes, the *Subtiaba*, *Nicarao* and *Chorotega-Mangue* are so unmistakably Mesoamerican in their culture that there can be no doubt as to their inclusion in this superarea, such doubts can arise with respect to the *Lenca* on the one hand and with respect to many tribes situated along Lake Chapala and the Rio Sinaloa on the other, since in both cases we find a cultural level quite inferior to that characteristic of tribes most representative of Mesoamerica. Notwithstanding this lower cultural level (which is also found among some tribes and even in some cultural areas in the interior of the territory of Mesoamerica), we include these tribes in Mesoamerica, because of the very considerable number of markedly Mesoamerican cultural traits, which in most cases go precisely to the frontiers which we have indicated. Thus for example, up to the northwestern boundary we find such cultural elements as the cultivation of chile, sweet potato, and fruit trees, the domestication of ducks and "voiceless dogs," metallurgy, the game played with rubber balls, etc. (see below), i.e., elements which Mesoamerica has in common with more southern cultures and which here reach their northern limit.

Culture Traits

In the distribution studies undertaken by the International Committee for the Study of Cultural Distributions in America to clarify the problem of Mesoamerica, studies which in turn profit from all the investigations carried out previously by other scholars, we have found three large distribution groups:

I. Traits exclusively or at least typically Mesoamerican.
II. Traits common to Mesoamerica and to other American cultural superareas.
III. Traits significant for their absence in Mesoamerica.

I

For the purpose of this first exposition of the problems in Mesoamerica, we prefer to combine in a single list, both those traits which are found exclusively in Mesoamerica, and also those which, although they are sometimes found outside, seem, nevertheless, to be characteristically Mesoamerican. With respect to the latter, we do not refer only to cases in which Mesoamerican traits are found in some tribes outside of Mesoamerica but bordering on it (such as the game with rubber balls among some food-gatherers and hunters of the north of Mexico), where the diffusion is undeniable, but also to cases such as that of the Pawnee of North America or that of the coast of Ecuador or northern Peru, where there is a grouping of traits so typically Mesoamerican that it allows of no other interpretation but that of cultural diffusion.

On the other hand, we include in this list only a few of the traits exclusively Mesoamerican but rare there, since most of these suppose for their existence that of others more widely found.

We consider as Mesoamerican traits the following:

A certain type of digging-stick (*coa*); the construction of gardens by reclaiming land from lakes (*chinampas*); the cultivation of lime-leaved sage (*chía*) and its use for a beverage and for oil to give luster to paints; the cultivation of the century plant (*maguey*) for its juice (*aguamiel*), fiber for clothing and paper, and maguey beer (*pulque*); the cultivation of cacao; the griding of corn softened with ashes or lime.

Clay bullets for blow-guns; lip-plugs and other trinkets of clay; the polishing of obsidian; pyrite mirrors; copper tubes to drill stones; the use of rabbit hair to adorn textiles; wooden swords with flint or obsidian chips along their edges (*macuahuitl*); corselets padded with cotton (*ichcahuipilli*); shields with two hand-grips.

Turbans; sandals with heels; one-piece suits for warriors.

Step pyramids; stucco floors; ball courts with rings.

Hieroglyphic writing; signs for numerals and relative value of these according to position; books folded screen-style; historical annals and maps.

Year of 18 months of 20 days, plus 5 additional days; combination of 20 signs and 13 numerals to form a period of 260 days; combination of the two previous periods to form a cycle of 52 years; festivals at the end of certain periods; good and bad omen days; persons named according to the day of their birth.

Ritual use of paper and rubber; sacrifice of quail; certain forms of human sacrifice (burning people alive, dancing dressed in the skin of the victim); certain forms of self-sacrifice (extraction of one's blood from the tongue, ears, legs, sexual organs); the flying game or ritual (*juego del volador*); 13 as a ritual number; a series of divinities, Tlaloc, for example; concept of several other worlds and of a difficult journey to them; drinking the water in which the deceased relative has been bathed.

Specialized markets or markets subdivided according to specialties; merchants who are at the same time spies; military orders (eagle knights and tiger knights); wars for the purpose of securing sacrificial victims.

II

The group of traits common to Mesoamerica and to other American cultural superareas* is divided into various sub-groups for which we give representative examples, with the caution that mentioning a trait for a particular superarea does not imply that it is found in all the component areas:

a. Southeast, Southwest, *Mesoamerica, Chibcha, Andes,* Amazonia: cultivation, ceramics.
b. Southeast, Southwest, *Mesoamerica, Chibcha, Andes*, Northwest Amazonia: cultivation of corn, beans, and squash.
c. Southeast, *Mesoamerica, Chibcha, Andes:* human sacrifice.
d. Southeast, *Mesoamerica, Chibcha, Andes,* Northwest Amazonia: cultivation of the sweet potato; blowguns, head trophies.
e. Southeast, *Mesoamerica*, *Chibcha*, Amazonia: cannibalism.

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*For this first orientation we recognize, in an entirely provisional form, the following superareas (the names of the superareas of superior cultivators are italicized):

Southwest (of North America, in the sense of "The Greater Southwest" or "Arid North America," i.e., including both inferior cultivators and food-gatherers and hunters).

Southeast (of North America).

Chibcha (excluding those who have cultural affinities with the Andes, such as, for example, the *Muisca*).

Andes (including the arid coast of South America).

Amazonia (including all the tropical forest of South America and the Antilles, but excluding the *Chibcha* of the tropical forest).

f. Southeast, *Mesoamerica*, *Andes*, Northwest Amazon: confession.
g. Southwest, *Mesoamerica*, *Chibcha*, *Andes*: cultivation in the hands of men; constructions of stone or mud; sandals.
h. Southwest, *Mesoamerica*, *Chibcha*, *Andes*, Northwest Amazonia: cultivation of cotton.
i. *Mesoamerica*, *Chibcha*, *Andes*: terracing for cultivation; hanging bridges; gourd rafts. Some of the traits of this group, perhaps the majority of them, are known within Mesoamerica only in the southern part.
j. *Mesoamerica*, *Chibcha*, *Andes*, Northwest Amazonia: cultivation of sweet cassava, chile (*ají*), pineapple, avocado, papaya, zapote, various kinds of "plums" or spondias (*jobos*); fattened voiceless dog; duck; woven shields, lances; metallurgy; roads paved with stones; markets.

These traits, contrasting with the preceding group, with the exception of woven shields and lances, go as far as the northern boundary of Mesoamerica.

k. *Mesoamerica*, *Andes*: clans of the *calpulli-ayllu* type; taking out the heart of living human beings; sprinkling sanctuaries with the blood of sacrificial victims.

In addition, there is a considerable group of traits common to the superior cultivators of Mesoamerica and inferior cultivators of Amazonia:

l. *Mesoamerica*, Amazonia: basket-work blowing fan; flat clay plates on which to cook bread (*comal*); game with rubber balls which cannot be touched with hands; wooden drum with languettes.

It is worthy of note that the traits of this group which reach the northern and southern boundaries of Mesoamerica are not known among the Jicaque, Paya, Sumo and Misquito tribes which border directly on Mesoamerica and are inferior cultivators like the Amazonian tribes.

Finally, an even more striking group of traits which Mesoamerica has in common with people who are not even cultivators:

m. *Mesoamerica*, food-gatherers and hunters: underground ovens; steam bath.

The traits which Mesoamerica, superarea of superior cultivators, has in common with other areas of superior cultivators or of inferior cultivators, or with both of these at the same time, pose a series of very important problems concerning both the formation of Mesoamerican culture within the aggregate of American cultures based on cultivation, and the relations existing between the superior and inferior cultivators. The division which we have made of these traits into various groups is designed to pose most effectively these problems. It does not seem possible to arrive at definitive conclusions before the distribution studies initiated by the aforementioned Committee have been completed.

One is struck by the fact that Mesoamerica, an area of superior cultivators within which no non-cultivating tribe survives, shares certain traits, lacking among the superior and inferior cultivators of South America, *with the American food-gatherers and hunters*, on whose North American area it borders directly along a part of its northern boundary, whereas it finds itself separated from the South American food-gatherers and hunters by other cultivators both superior and inferior. The fact that these traits go as far as the southern boundary of Mesoamerica, and no farther, tends to separate Mesoamerica from the other great areas of superior cultivators, as well as from the areas of inferior cultivators of South America (with which, on the other hand, it shares such significant traits). But one must remember that these traits characteristic of hunters and food-gatherers are not and cannot be basic to or constitutory of

Mesoamerican culture, although undoubtedly they lend it a "flavor" distinct from that of the other areas of superior cultivators, especially those traits which like the steam bath have come to be linked so intimately with Mesoamerican culture. But even though it is true that these traits come to the end of their North American distributional area at the southern boundary of Mesoamerica, they can't be called "North American" because they are also found among the food-gatherers and hunters of South America, unless we want to call these latter likewise "North American."

In order to have been able to reach the extreme south of South America, through all the region recently occupied by superior and inferior cultivators, these traits must have spread before the formation not only of Mesoamerica and the other areas of superior cultivators, but before the beginning of cultivation itself, disappearing later in certain regions.* Their presence in Mesoamerica and absence in the other areas of cultivators in South America, allows of one of two explanations: either they disappeared only in the areas of (superior and inferior) cultivators situated to the south of Mesoamerica, but not in the latter, or they first disappeared in both regions, to be later reintroduced into Mesoamerica from the north by new invasions of food-gatherers and hunters. In any case, the extension of these elements up to the southern boundary of Mesoamerica, even though it does not give to Mesoamerica a "North American" character and does not allow us to draw an ethnographic boundary between North and South America which would coincide with our southern boundary of Mesoamerica, does demonstrate what we have asserted in previous paragraphs and with different arguments: the fact that Mesoamerica is undoubtedly a cultural unit which has had its own history for a long time, common to all its inhabitants, even with respect to those traits which are *not* basic to it.

III

The traits of the third group whose distribution is related to the problem of Mesoamerica are those whose absence in Mesoamerica is characteristic. This group is divided into various sub-groups:

a. Southeast, *Chibcha:* adornment of the edge of the ear.
b. Southeast, Southwest, *Chibcha,* Northwest Amazonia: matrilineal clans.
c. Southeast, Southwest (food-gatherers and hunters of Nuevo Leon), *Chibcha,* Northwest Amazonia: drinking the ground-up bones of deceased relatives.
d. Southwest (Sinaloa-Sonora), *Chibcha,* Amazonia: poisoned arms.

These types of distribution, to which one should probably add others, lead one to suspect that we are dealing with elements once present in Mesoamerica, either merely in the *territory* later to become Mesoamerican or within the Mesoamerican cultural aggregate itself. Especially suggestive is the case of the custom of drinking the ground-up bones of one's deceased relatives, corresponding to which within Mesoamerica we find a custom which may perhaps be interpreted as a more evolved phase which has taken its place, the custom of drinking the water in which the deceased relative has been bathed.

With the preceding we might contrast certain cultural traits of the cultivators of

*We know only one case of the use of the steam bath among the food-gatherers and hunters of South America. The second South American case, not cited up till now in the comparative literature and one which must be the result of a different and much later diffusion from a Mesoamerica already existing as a cultural unit, is found among the superior cultivators of the coast of Ecuador. Unfortunately there are no details of the steam bath found there, so that we do not know whether it had the structural details which distinguished the Mesoamerican steam bath from that of more northerly tribes.

South America which go as far as the southern frontier of Mesoamerica, but do not pass it:

e. *Chibcha, Andes:* cultivation of coca.

f. *Chibcha, Andes*, Amazonia: cultivation of palm trees.

The distribution of these two groups of traits leads us to believe that they never were a part of Mesoamerican culture.

Notwithstanding its entirely provisional character, we felt that it was time to present to the readers of this new journal the preliminary results of the investigations of Mesoamerica initiated by the International Committee for the Study of Cultural Distributions in America, not only in order to report on the present state of these investigations, but also in order to stimulate a thorough critical discussion of the method followed and the results obtained to date. The author of the present article, in his capacity as secretary of the Committee, would like very much to receive suggestions as to the best way to continue this work, together with data on other investigations which bear directly or indirectly on the problem of the cultural individuality and the history of Mesoamerica, whether from investigations already completed or from those in process of being carried out.

TRAITS COMMON TO MESOAMERICA AND TO OTHER CULTURAL SUPERAREAS OF AMERICA: AND TRAITS SIGNIFICANT FOR THEIR ABSENCE IN MESOAMERICA

Presence of traits—X *Absence of traits—O*	*South-east*	*South-west*	*Meso-america*	*Chibcha*	*Andes*	*Ama-zonia*
Cultivation	X	X	X	X	X	X
Ceramics	X	X	X	X	X	X
Corn	X	X	X	X	X	X*
Beans	X	X	X	X	X	X*
Squash	X	X	X	X	X	X*
Human sacrifice	X	O	X	X	X	O
Potato	X	O	X	X	X	X*
Blowgun	X	O	X	X	X	X*
Head trophies	X	O	X	X	X	X*
Cannibalism	X	O	X	X	O	X
Confession	X	O	X	O	X	X*
Cultivation done by men	O	X	X	X	X	O
Construction of stone or clay	O	X	X	X	X	O
Sandals	O	X	X	X	X	O
Cotton	O	X	X	X	X	X*
Terracing for cultivation	O	O	X	X	X	O
Hanging bridges	O	O	X	X	X	O
Gourd rafts	O	O	X	X	X	O
Sweet Cassava	O	O	X	X	X	X*
Chile (ají)	O	O	X	X	X	X*
Pineapple	O	O	X	X	X	X*
Avocado	O	O	X	X	X	X*
Papaya	O	O	X	X	X	X*
Zapote	O	O	X	X	X	X*
Spondia	O	O	X	X	X	X*
Fattened voiceless dog	O	O	X	X	X	X*
Duck	O	O	X	X	X	X*
Woven shields	O	O	X	X	X	X*
Lances	O	O	X	X	X	X*

*In the Northwest.

Presence of traits—X *Absence of traits—O*	*South-east*	*South-west*	*Meso-america*	*Chibcha*	*Andes*	*Ama-zonia*
Metallurgy	O	O	X	X	X	X*
Roads paved with stone	O	O	X	X	X	X*
Markets	O	O	X	X	X	X*
Clans of the *calpulli-ayllu* type	O	O	X	O	X	O
Removing heart from living persons	O	O	X	O	X	O
Sprinkling sanctuaries with blood	O	O	X	O	X	O
Basketwork blowing fan	O	O	X	O	O	X
Plates for cooking bread	O	O	X	O	O	X
Game with rubber ball	O	O	X	O	O	X
Wooden drum with languettes	O	O	X	O	O	X
Adornment of edge of ear	X	O	O	X	O	O
Matrilineal clans	X	X	O	X	O	X*
Drinking ground-up bones of deceased relatives	X	X	O	X	O	X*
Poisoned weapons	O	X	O	X	O	X
Coca	O	O	O	X	X	O
Palm trees	O	O	O	X	X	X

—1952

*In the Northwest.

2

Period, Style and Meaning in Ancient American Art

by George Kubler

Q. How long is a piece of string?
A. As long as there is any.
— old English riddle

The word "period" encloses many meanings. In archaeology, its minimal sense is as a "unit of time or contemporaneity," differing from a "stage," or "unit of cultural similarity."[1] Period also means recurrence among similar units of duration, in the sense conveyed by periodicity and specific duration.

The life-span of each species is a known duration, and every member of the species shares that duration. Whatever exists may be said to have or to share in a specific duration. Similar existences display similar durations. Each such specific duration is a form of periodicity. If every entity has a specific duration, everything definite will have a knowable period. Conversely, those notions about which period is unclear probably lack definiteness. When we are unsure about something, our uncertainty is measured by our inability to define its period.

Many historians rightly question the credibility of most periodizations. For instance R. M. Mayer showed that periods in history are neither necessary nor self-evident, and that periodology is entirely a matter of convenience dependent mainly upon aesthetic considerations, especially in regard to the proportion and number of periods.[2] J. H. J. van der Pot concurs in stating that "it is impossible to formulate directives for the correct proportion of the duration of the periods in relation to each other, and for their number." He urges that periodization, which "forms the quintessence of history," should be idiographic (i.e. not based on "historical law") and endocultural, arising from subject matter rather than from exocultural "necessities of geography, biology, or the psychical qualities of man."[3]

Such cautionary remarks actually register the absence of certitude among historians about their studies. They are unable to agree upon periodization because the matter of history is far too complex for the prevailing methods of historians to handle. The lack of necessary agreement about historical periods is directly related to the nature of historical thought as a mimetic exercise and to historical writing as an art of representation (see pp. 18f.).

Having no intrinsic segmentation of its own, time divides only for organisms experiencing sequences of actions. The historian who is unsure about the specific durations of most of the entities he studies, nevertheless feels free to stress either the regularity of artificial periods like centuries and decades, or the irregularity of actual durations. He is aided in these efforts by a psychological process called transduction. Here, repetitive stimulations, as by similar events or objects, induce a spatialized illusion of coherent surface. The phenomenon has been studied in animals: when certain nerves are stimulated the animal begins to crawl, as if transforming a periodic stimulation into a perceptual object.[4] In this respect transduction includes the impulse to periodize. When exercising this faculty for spatializing time, historians are exposed to several dangers. Transduction risks mistaking or interchanging the duration for the moment and of inverting distance with sensation.

Among other related perils to which archaeologists are exposed is one which may be called hardening of the periods. Whoever defines a period runs the risk of becoming its jealous guardian. The period acquires under the diligent care of its keeper an increasingly rigid character. Hence archaeological history is often written as though time turned itself on and off, stopping whenever the archaeologist demands, and beginning again with his renewed license to do business. Thus the many excavators of the Olmec sites on the southern Gulf Coast now insist more and more categorically upon an irrevocable death for Olmec culture before 400 B.C., despite the frequent recurrence of Olmec forms in much later contexts, as Proskouriakoff showed in 1968.[5] Another case of hardened period: in the Central Andean Coastal valleys, pottery of Cupisnique style generally is taken to be coeval only with Chavin art, and therefore to end about 700 B.C. But the vessel-handles of late Mohica pottery appear with Chavin-like designs, marking a possible continuity lasting perhaps 1000 years beyond the decreed death date for the "real" things.[6]

Megaliths, on the other hand, are antipodal to plain sherds, being colossally difficult to break. Actually, megaliths are extremely restless, and they are the most ghostly reefs the archaeologist encounters in his quest for chronology. Megaliths rarely remain long in one place, being too valuable to leave alone like sherds on the refuse heap. Megaliths return to use over and over, being exhumed, transported, and buried again in deep pits many centuries old, and dug up again, smashed, mended, and reappearing where and when the need for big sculpture recurs. An ancient megalith incorporates tradition and therefore invites removal while resisting destruction. Being mineral its own historic age cannot be known by radiocarbon: it looks like an uncharted island upon our imperfect maps, skewing our graphs, and drawing our theories to destruction. Dating megaliths by the surrounding strata is like dating a piece of sculpture by the architecture of the museum containing it today.

Since all periodologists are self-appointed, the only letter of credit any aspirant can show is his own periodological scheme, to be considered among others on its merits. I shall suggest one dealing more with the geometry of temporal containers than with their contents. It is an "empty" chronology, filled only with the thin air of cultural theory (Fig. 1).

The most rigorous critics of periodization will probably agree in principle that

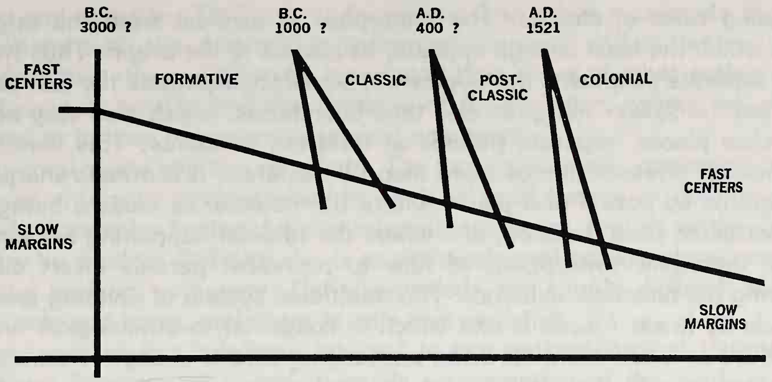

Figure 1. Regional rates of change and period boundaries.

American antiquity in the interval between the fourth millennium B.C. and the sixteenth century A.D. may be scanned as three ages, neutrally designated as early (I), middle (II), and late (III). The boundaries between these ages, as well as the characteristics of the ages, are indeterminate, because of the imprecision of historiographical language. We nevertheless may postulate several quantities both as to the boundaries and as to the ages. The ages have both long and brief durations within their spans, varying as to the centers and the margins of activity. The boundaries likewise are variable as to duration in the slow and fast regions. A slow boundary may last ten centuries in marginal places, and a fast boundary, shown near the top of the diagram, may be as short as a century for events in central places. The metropolitan centers are fast, and the provincial margins are slow. The fast centers multiply as time goes on, while the slow margins diminish. The boundary between periods may occupy different centuries in different places. Each place has its own rate of happening at any moment. It may also reverse as center or margin. Being also indeterminate, the characteristics of the ages are unknown but we may assume without abusing either the archaeological evidence or the anthropological theories, that the ages vary in character according to the number and density of people.

Early cultural time contained more small groups living in greater isolation from one another than during the second age, when the distribution altered, to include more people living in fewer groups, each of which was larger. The third age contained even larger groups competing for dominance in the regions of fast happening, but the slow margins stayed fragmented and isolated as in the early period although fewer in number. Some of these relationships are suggested in the diagram. The coordinates are temporal, differing as to rate and period. Because overall diffusion never is uniform, the boundaries are not the usual immaterial and unreal fences or points; they vary according to place and duration. Fast and slow places change differently, and may reverse their roles, centers becoming margins and vice versa. The slopes of the boundaries are steeper initially than terminally because integrations seem slower than collapses. Early is slower than late, both in duration and in the increasing number of places where significant change occurs. The boundaries are at least as interesting analytically as the ages. What always has been shown in graphs and charts as mere linear division, coinciding with some point in time, actually has properties and magnitudes peculiar to itself.

The type of chronological diagram proposed here stresses the boundaries between periods as much as it does the usual columnar division by area and period. In order to diagram conditions at the boundary, we need an areal coordinate graduated

by increasing rates of change. The metropolis is farthest from the origin. Those groups in which the least change appears, lie closest to the origin. Thus two kinds of boundary separate peoples: a developmental boundary separates the fast-paced urban centers from the slower margins; and time-boundaries, which also vary according to fast and slow places, separate periods at different moments. This variable way of dividing periods stresses change more than permanence. It contrasts sharply with the usual diagrams by period and place, where the boundaries vanish, being linear divisions abstracted from duration, and where the rates of happening are ignored.

These divergent conceptions of how to represent periods affect our ways of manipulating the historical evidence. The traditional system of dividing areal columns into periods by linear fences is one which is congenial to ethnological analogy (pp. 20f.), because an undifferentiated and unchanging rate of change is assumed to connect the present with the remote past, as well as to connect areas related only by structural similarities of culture. In each region the environmental conditions, which remain constant, tempt the student to suppose that basic cultural behavior remains equally constant, being only deflected by cross-cultural influences without losing identity. Because the boundaries between periods are ignored by their linear representation all the phenomena of disjunction (p. 22) are minimized, and continuity is maximized.

When, however, the fluctuating character of the boundary between periods is shown, in relation to fast-and-slow changing societies, the discontinuities of the fabric become more evident. For example, certain analogies are suggested by likenesses between settlement plans on Amazonia and in the Peruvian highlands.[7] But these can be seen to refer to societies having unlike rates of change (for unknown durations, along still undetermined lines of diffusion), when the relationship is plotted upon a diagram correlating period with the areal rates of change. If an agreement could be reached on representing historical processes by plotting areal rates of change against periods, the limitations of ethnological analogy (see pp. 20f.) would appear more plainly than under the present graphic conventions of columnar diagramming.

The Stylistic Quest for Chronology

Americanists studying antiquity have always had to worry more about simple chronology as such, than have any of their contemporaries who were engaged in the study of other areas of the world, mainly because the sorting out of this ancient history was impeded either by the absence of written sources, or by the presence of writings that could not be read. No absolute or intrinsic measures of duration were available until the discovery of quick earth-clocks like radiocarbon measurements about 1950. Even now, pottery seriations, with their torpid and non-reflecting durations, remain the principle yardstick of American archaeology, in a long and still incomplete speculation about simple sequences in chronology.

How far is it permitted to read history from pottery styles? This question asks how much information pottery carries. For over a century archaeologists have hopefully questioned remnants of pottery for signs of periodization. This long quest for the meaning of the sherds has produced an incomparable history of pottery, but not a history of civilization, because pottery alone does not reveal much more than itself. It is less mute when pictures are carved or painted upon it, but these have to do with signs and images, and the pot, like wall or cloth, is only the support for them. Usually, however, the pottery is used as a yardstick to show the relative dates of other objects like the tombs and buildings containing the pottery or the layer in which it lies. But none of this information is intrinsic to pottery; it is deduced from position and context. The sherds alone are mute and self-centered, telling only of existence,

technique, and duration. Their tale is far slower than other man-made histories, and its connections with the rest of happening are tenuous. When pottery is used to measure durations, its own intervals are slower than those of other scales; its specific rate of change is torpid, and the rhythms of its evolution cannot be accepted as summations or indices of general historical processes.

An interval spans any two moments. The intervals usually appearing in historical chronologies are easily distinguished by their integral factors as definite and indefinite periods. Examples having definite integral factors are a reign, or the dated rule of one country by another. Definite also is an archaeological pottery phase, even within a relative and undated sequence. Definite periods are simply defined; the yardstick measures only one thing, and there is only one yardstick.

An example of the indefinite integral is any anthropological "stage." Such a stage is like "Baroque art," and it equals a summation of the work of uncounted persons during several generations, spread out over an indefinite territory. The exact domain is unbounded; the duration is uncertain; and the integral factor has no numerical definitions. An intuition alone binds these diverse strands. Definite integrals are limited by their single factors as to scope, while indefinite integrals are limited by their intuitive origins as to precision. Instead of the yardstick, associations reached by empathy and insight are the instruments of knowing. American archaeology is mainly based on definite integral methods, but the cultural history erected upon these foundations relies upon the indefinite integrals of intuition and analogy.

The history of the formulation of such indefinite, complex intuitional integrals in American antiquity began only recently, with the appearance among archaeologists of an acute temporal claustrophobia about 1940. George C. Vaillant had suffered from it for about a decade, while his famous excavations in the Valley of Mexico[8] began to require him to assign them longer durations for typological and statistical reasons than the traditional native cosmogonies and histories allowed. Since Vaillant's work preceded the invention of radiocarbon dating by nearly two decades, all thoughts in his time about duration still were based upon relative seriation. As these seriations became denser and longer, Vaillant found his position increasingly awkward, by having to rely upon native scripture about brief periods, in order to explain stratigraphical durations of great depth and density.[9] He complained in conversation that every excavation seemed to produce a new culture, and that the multiplication of these found no correspondences in any texts. His experiences in effect repeated that of the mid-nineteenth century paleontologists who met failure in trying to account for their observations of bones in ancient geological strata, by means of scripture placing the Creation in the fourth millennium B.C.

Vaillant's early guesses eventually proved surprisingly accurate as to seriation,[10] but he and other sceptical archaeologists remained nevertheless unwilling to accept the idea that American civilizations could be very ancient. They were reluctant to appear impressed by age for its own sake. Seeing no reason to try to connect American and Old World styles of art, they resisted the diffusionist suggestion that ancient American urban cultures could antedate the time of Christ by very long. The result before 1950 was a chronology highly compressed or condensed, which exaggerated the claustrophobia of which Vaillant complained, although he helped create the malaise by his reluctance to sponsor any long estimates of duration.

The end of the 1940's witnessed two events of great importance in the study of American antiquity. One was the use of evolutionary schemes of social interpretation, following the lead of European prehistorians like V. Gordon Childe.[11] The other was the discovery of radiocarbon dating.

Wendell Bennett and Junius Bird broke through the barriers that had confined their predecessors with a little handbook in 1919 entitled *Andean Culture History*. They sought to group and classify again the great variety of artifacts from that region according to an evolutionary scheme (Fig. 2). For the Central Andes, periods of local cultures alternated with pan-Peruvian periods, in culture-stages appearing as early, middle, and late segments of archaeological history, and divided according to the dominant modes of economic activity and political organization under rubrics as "periods," like Cultist (*ca.* 1000-*ca.* 0 B.C.), Experimenter (*ca.* A.D. 0-600), Master craftsman (*ca.* A.D. 600-1000), Expansionist (*ca.* 1000-1200), City Builder (*c.* 1200-1450), and Imperialist (after 1450).

Later on in Mesoamerican studies this scheme was adapted for use in Maya and Mexican archaeology as formative, classic and post-classic periods. The invention by Willard Libby[12] of a simple and reliable method of dating artifacts in or of organic matter, by measuring the residue of radiocarbon, then allowed dates to be assigned to

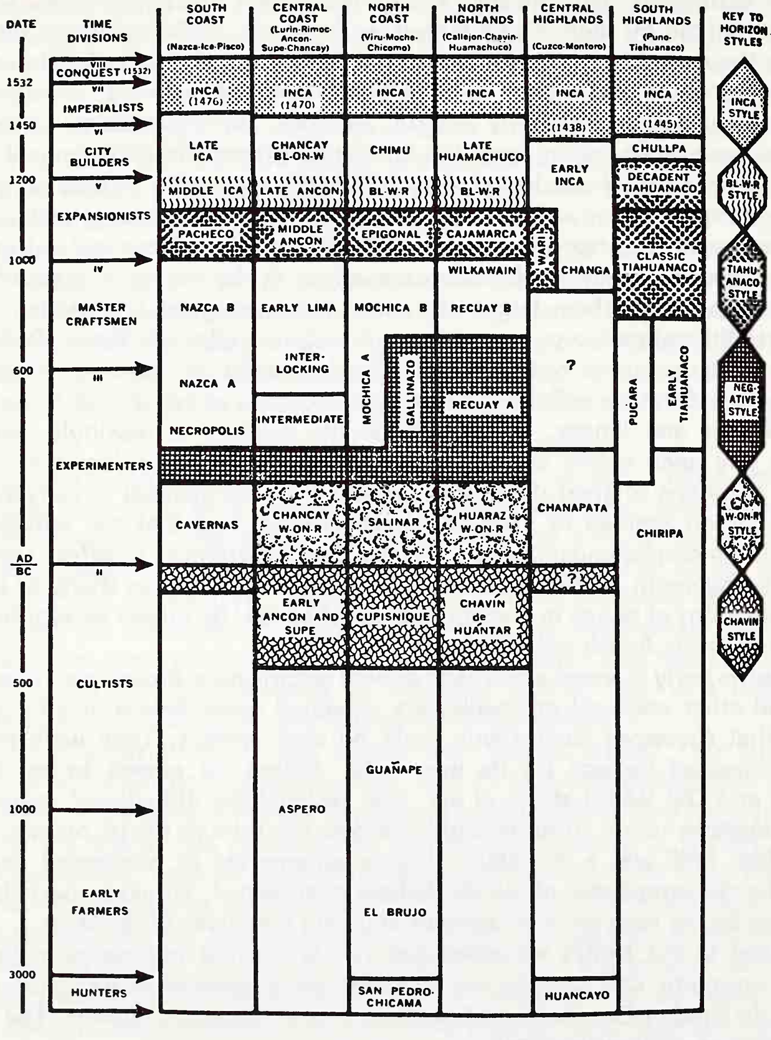

Figure 2. Chronological chart for the Central Andes (Bennett and Bird, 1949).

some objects, which were assumed to belong to these segments of the evolutionary scheme. Thus pre-formative and formative periods were separated at about 2500 B.C.; formative and classic at *ca.* 0; classic and post-classic A.D. 1000 *ca.* ± 200. In this way an escape from too brief durations appeared at the oldest end. Recent durations remained brief, but the older ones became longer, as if in proportion to their antiquity. Americanist prehistorians today are inclined to admit an age of 35,000-40,000 years for man in America,[13] whereas in 1950 they were not ready to concede him more than 10,000 since arrival from Asia.

The authors of *Andean Culture History* took pains to distinguish carefully between their descriptive and their conjectural matter. The section on the Central Andes begins with a compact description of artifact chronology, based on stratigraphy, surface sampling, seriation, and the establishing of six "horizon styles" (p. 108). These last are marked by distinctive figural designs or pottery techniques, or a combination of several designs and techniques.

Now conjecture begins: the observed spread of the horizon styles supposedly results from "simple diffusion, a domination religion, or political conquest" (p. 107). It is a conjecture based upon a cross-cultural analogy of extrinsic nature. The next leap into conjecture occurs with the division of the horizon-style chart into seven major "periods" (i.e. stages). The time-divisions are admittedly arbitrary, and each "period" was selected to represent a "significant step in the historical development" (p. 113). Such descriptive names as "Cultist" belong in the class of highly influential but doomed philological coinages. They indicate the "outstanding characteristics or trend for the period as a whole" (p. 113). Here the *Zeitgeist* appears fully fledged, waiting for the hunters who will shoot it down.

These two simple steps in conjecture accomplish the great leap from archaeological description to cultural interpretation. It is to be noted that the divisions have durations different from those assigned to the horizon styles. The durations do not blindly obey the horizons, nor do the "culture-stage" names. Thus the stage-names and the durations are both conjectural. The durations are loosely geared to the horizons, and the period names are emblematic of how the authors read culture history from the artifact record.

The Andean Cultists are said to have observed pilgrimage rituals (p. 137), deduced by ethnological analogy from modern shrines like Copacabana. Experimenters (p. 152) abandoned this cult (localism vs. pan-Andean cults); Mastercraftsmen lived under an elitist class structure (p. 181); expansionists imposed a renewed political or religious unity (p. 200), reverting in the religious aspect to the Cultists; City Builders expanded urban life in large cities; Imperialists reunified the Andean world by conquest.

By names, by characterizations, and by their "periods," these stages thus came to life in anthropological literature. I do not believe that Bennett and Bird expected the clean sweep, but professional acceptance of their work was immediate. The Andean "periods" soon after were accepted by many uncritical readers as having each a united and homogeneous "spirit of the time," consisting of cultural patterns, artistic styles, and socio-political ideas. George Boas[14] called it "spiritualistic monism" when he was talking about its older importance in the European history of art, as in the writings of Heinrich Wölfflin, or in the blind reification of Mannerist and Baroque "periods" (*sc.* stages) by many scholars.

In America the same thing happened. Clear, distinct and separate "periods" were needed to teach beginners, regardless of those periods' shaky foundations in analogical thinking. Americanists needed such schemes of classification, and the

Maya and Mexican seriations soon were brought into line by their division into formative, classic, and post-classic stages,[15] as expounded by R. Wauchope, A. V. Kidder, J. E. S. Thompson and A. Ruz for the Mayas or H. B. Nicholson for Mesoamerica as a whole. In the beginning, however, "Formative" corresponded to the Andean Cultists; "Classic" to Experimenters and Mastercraftsmen; and "Post-classic" to the final three Andean stages. The philological source was Greek and Roman archaeological usage. For earlier epochs Vaillant had already rejected Spinden's suggestion of an American "archaic hypothesis," preferring to call his then-earliest Valley of Mexico finds the "Middle" cultures, in the expectation of finding still earlier periods.[16] The resolving term as "Formative" first came into general use in 1950.

This system of using cultural stages for chronological purposes was badly shaken soon after its adoption by discoveries that did not conform to its expectations. Village life as the only urban form had seemed to distinguish "formative" from "pre-formative" time, but earliest Peruvian coastal settlements now display "village" from a thousand years earlier. Later on, the middle or "classic" period throughout nuclear America has been being absorbed from both ends by the formative and post-classic stages. Alfonso Caso's brilliant reconstruction of Mixtec dynastic history from pictoral manuscript sources[17] proved that the militarist expansions—which were supposed to have happened only in post-classic time—actually were occurring in the full Classic stage. Later discoveries by Proskouriakoff[18] proved the presence of similar habits of aggressive expansion among the Classic Maya, whose sculpture she showed to be predominantly about historic events and dynastic rulers. More recently Michael Coe[19] suggested that dynastic sculpture occurred among Olmec peoples prior to 400 B.C., and according to him as early as 1200 B.C. at San Lorenzo, in full Formative.

Thus the content of the culture stages has been under constant correction and censorship, but their current use as "empty" chronological containers seems to be of continuing value, by marking the pre-Columbian past into neutral periods called early, middle and late, which imply nothing, either as to content or as to *Zeitgeist*.

During the later 1950's many archaeologists began to devise ways to escape the mirage of the "full" *Zeitgeist* interval. Such "stages" displayed an evolutionary circularity of method, whereby the desired conclusions were among the premises. Andeanists in particular had already concentrated upon total seriations from single coastal valleys, like Virú in the north[20] and Ica in the south. They hoped to establish complete total sequences in order to key similar artifacts found elsewhere to the relative positions in the model seriation. In Ica valley John Rowe and his associates established a "master-sequence" (meaning not the "core-area," but the "yardstick"). Presenting thirty stylistic intervals between 1500 B.C. and A.D. 1500, their scale corresponds to centuries, grouped as early (1400-1500), middle (550 B.C.-A.D. 900) and late (900-1500). A convenient "Early Intermediate" runs from A.D. 900-*ca.* 1460, to break the excessively long early and late durations (although conventionally numbered centuries would have done the same work more simply).

In a theoretical study (cited in note 6) Rowe explained his method as a way of restricting *period* to "units of contemporaneity" and *stage* to "units of cultural similarity." *Period* thereby reduces to any moment, whether long or short. Although Rowe would like to eliminate stages from archaeological discussion, he still reverts to stages when constructing his table of chronological comparison among different regions, or when identifying Andean cultural time prior to 2100 B.C. as "*pre-ceramic.*" His stages, however, have the advantage of resting upon firm period determinations as to what is contemporary. His periods in turn are keyed to local sequence. But local

sequence depends upon the seriation by archaeological means of those "stylistic subdivisions," as Rowe says, "which can be distinguished in the master sequence."

As with Bennett and Bird in 1949, the classificatory idea of style lies at the evidential base of the argument rising to period determinations. In other words, style determinations precede local seriations. These latter precede periods. Stages, finally, are about cultural similarities. Because Rowe regards "style" as the primary level of abstraction in periodization, some comment is in order upon the conditions limiting the use of the idea of "style." The next paragraphs are the conclusion to my paper on "Style and the Representation of Historical Time," in *Annals of the New York Academy of Sciences*, 138 (1967), 853-55.

> The notion of style has long been the art historian's principal mode of classing works of art. By style he selects and shapes the history of art. We therefore need to correlate, if we can, style and duration.
>
> Uncritical usage in the history of art permits the word style to be used in different and mutually exclusive ways. On the one hand, style is cited as a configuration of qualities shared by many objects spread throughout a long span of time, as though the shared configuration were immutable in composition and intensity. Meyer Schapiro says it: "Style is constant form."[21]
>
> On the other hand, style means all the systemic changes we observe in the history of a cluster of traits of forms, much as the word "weather" stands for constantly changing relationships of temperature, pressure, humidity. A. L. Kroeber describes style as a strand in culture, which is best studied as to content, structure, and flow with development as its most characteristic trait.[22]
>
> James Ackerman likewise specified style as a relational concept,[23] under the operational view that the concept of style "is a means of establishing relationships among individual works of art," like the concepts of society and culture, which are also based on relationships.
>
> If we proceed on the assumptions that style is both relational and developmental, we need to test the connection between relatedness and change. Several propositions, seven at least, can easily be advanced, together with their counter-propositions.
>
> 1. Styles, being historical configurations, are neither perpetual nor in random change. Being in change however, their identify is in doubt at every instant.
> 2. Elements dispersed evenly throughout all historical time cannot mark style. Yet style presupposes such stable configurations within limited durations.
> 3. Style is identifiable only among time-bound elements. Yet if the components are in differential change as they always are, the relation among them is a changing one.
> 4. Presupposing a style presupposes that it has a beginning and an end, although the components may have begun earlier, and might end later than the style itself.
> 5. Each kind of human action has its styles: no actions or products escape style. Yet the preceding observations suggest that such configurations are more instantaneous than extended in duration.
> 6. We participate in going styles, and we observe past style. But the operations of esthetic choice are unpredictable: a past style may at any instant be revived.
> 7. Different styles can coexist, like languages in one speaker. Such coexistence itself can be more various than style.

> I assume that it is probably impossible to portray the content of any duration, without invoking the idea of style, if only as a classificatory convenience. Yet when style is mentioned the problem arises as to which one among many entities or components is regarded as having style. Even in isolated, single objects, such as the Parthenon, or a human body, belongs to several different developmental systems. Each of these—the blood, the skin, the kidney—displays different systemic ages. The rose window, for example, at Chartres Cathedral, has a systemic age unlike that of the ogival vaults, and the two pieces, vault and rose, should therefore be ascribed to different styles, which the usual classification as "Gothic" lumps together.
>
> Thus a major contradiction arises from the use of the term style. The idea of style is best adapted to static situations, in cross-cut or synchronous section. It is an idea unsuited to duration, which is dynamic, because of the changing nature of every class in duration.
>
> The necessary solution of the difficulty with "style" is to restrict the use of the word to discussions removed from duration. When flow and change are ignored, and when development is disregarded, "style" remains useful as a taxonomic convenience. But wherever the passage of time is under consideration, with its shifting identities and continuous transformations, the taxonomic notion, represented by the term styles, becomes irrelevant. Thus style and the flow of happening are antinomics. Style pertains to timelessness; and flow concerns change.
>
> I conclude that the idea of style is best adapted to the description of synchronous situations involving groups of related events. But style is a notion unsuitable to diachronous durations, because of the composite nature of every imaginable class as a bundle of durations, each having widely different systemic ages.
>
> In short, the idea of style is better suited to extension than to duration. When we are dealing with large durations, words describing time work better than extensional words like style.

Rowe's views and mine seem here to converge, in that his use of stylistic analysis is restricted to synchronous or momentary situations of short duration (the "phases"). When speaking of "horizons," however, which he presents as durations on the order of one-half to a full millennium, Rowe no longer refers to style.

Ethnological Analogy

Having greatly lengthened ancient Mexican chronology by his excavations, George Vaillant shortened it again when he sought guidance from early native and Spanish texts. Because they sent him on contradictory paths and down lanes going nowhere, he was baffled and exasperated. Unlike the philologists, for whom textual inconsistencies are useful linguistic clues, Vaillant was acting as an iconologist in trying to match texts with objects, but he was unable to combine the fragmentary chronicles written for Charles V with the pre-historic sherds and figurines which we now know as some two thousand years older. Fortunately his archaeological reports ignore the texts, and they follow out only the implications of stratigraphy and seriation. Thus his enlargement of Mexican archaeological history both contradicted and enriched native scripture, but he could not have uncovered the early history of the most ancient villages of the Valley of Mexico by soliciting the chronicles alone.

For Vaillant to discard the chronicles was not easy because his teachers and predecessors all venerated these sources. From before the time of Eduard Seler to the present, scholars have relied upon reasoning by ethnological analogy. This principle tempts the investigator who is studying an ancient society, to draw conclusions about it from the customs of a modern society descending from the ancient parent, if he can prove them to be structurally similar.

Eduard Seler was especially given to this kind of analogical reasoning, but he was not much interested in chronology or seriation. He preferred typology and iconography. His writings lack any systematic study of periodization, even though he was much interested in calendars. His book-length study of Teotihuacán[24] says nothing about its date, and it is likely that he thought of it as an immediate predecessor to Aztec society, although it is now certain that the climax of Teotihuacán preceded Montezuma II and Hernan Cortés by over a thousand years, being to the Aztecs in centuries as Hellenistic rulers were to Ostrogoths.

In this way Seler was inclined to believe that Sahagún's informants' descriptions of Aztec life[25] pertained also to societies we now know to be much older than he thought they were. Seler's method of historicoethnological analogy still governs Mexican and Maya studies in all departments of archaeological and ethnographical research. For instance, it is today an official Mexican government position that Teotihuacán was built by Nahua-speaking peoples, and that Aztec god-names are the names of Teotihuacán. The arguments against this dogma are many, and this is not the place to present them. Where periods are discussed, however, the habit of reasoning by ethnological analogy raises questions.

At best, analogy approaches a limited form of induction. But it is weakened by its dependence upon metaphor ("*a*, being like *b*, is structurally related to it") and allegory ("*Zeitgeist* affects events"). After Vaillant abandoned ethnological analogy in his archaeological work, he reverted to it only in popularizations. He said in 1935 that too much reliance on texts tended to shrink the time-values imposed by field archaeology. When Vaillant could not confirm his excavations by the native scriptures, he began to eliminate textual studies from stratigraphy. One of his last syntheses[26] reviews the entire field without mention of ethnohistorical analogies.

Today pre-Columbian Mexican studies still are dominated by ethnological analogizing. Few people resist its invitation to explain the remote past by the tribal present. It surely is reasonable to use sixteenth-century records to explain modern tribal life. But to use Sahagún to explain the oldest Mexican urban societies is as unprofitable as to try to explain ancient Egypt by the Muslim historians.

An alternative to analogizing is to consider the total visual configuration of an ancient site or group of sites as the primary source of information. Such studies, as at Teotihuacán, or in classic Maya art, are concerned more with iconographic clusters than with pottery types and chronology.[27] As long as entire configurations of evidence are under study, the fragmentation of analogizing is minimized. An example of the analogical distortion and reduction of an ancient urban culture appears in a recent study of Olmec "were-jaguar" images.[28] Furst claims by ethnological analogy with extant Amazonian tribes, that the Olmec images signify a "shamanic" function of the type named for extant Siberian tribes. He holds that these analogies keep closer to Amerindian "cognitive systems" than does our own "scientific world view." But he disregards the erosive powers of three thousand years of cultural change. Olmec peoples in 1000 B.C. were not nomadic but urban, and they fashioned imposing sculpture and architecture. It is unproven that Siberian or Amazonian "shamanism" was established anywhere in the New World in 1000 B.C., or that the practices reported by nineteenth-century ethnologists had remained unchanged from that time. The earliest American instances of "shamanism" are still chronologically undetermined. The beliefs of shamans and their clients are probably a recent mosaic of borrowings, less archetypal than historically contingent.

Form and Meaning Disjoined

The special insights conferred by iconographic study arise from an examination of

the changing relationships of form and meaning throughout very long durations. Two axioms of iconographic method are (1) that a visible form often repeated may acquire different meanings with the passage of time and (2) that an enduring meaning may be conveyed by different visual forms.[29]

Erwin Panofsky extended this perception to the systematic study of medieval Christian iconography, emerging with a formulation as follows, ''wherever a [medieval] sculptor or painter borrows a figure or a group from classical poetry, mythology or history, he almost invariably presents it in a non-classical, viz., contemporary form.''[30] In another version Panofsky called this the ''principal of disjunction,'' in the lectures given at Stockholm in 1960 under the same title of *Renaissance and Renascences in Western Art*.

Disjunction, which is a mode of renovation, may be said in an even wider frame of reference to happen whenever the members of a successor civilization refashion their inheritance by gearing the predecessor's forms to new meanings, and by clothing in new forms those old meanings which remain acceptable. The successors thereby unconsciously obey a rule of least effort,[31] and they unwittingly salvage large parts of a tradition without having to discard everything, or reinvent everything. In effect, the cumulative character of the succession of cultures in a given region is unthinkable without the selective discarding which is implicit in disjunction. Panofsky's demonstration with medieval and Renaissance materials proved that any transcultural duration (i.e. parent and successor on the same ground) can be quantified in respect to disjunction. The quantification may be coarse, but it is undeniably a measure of old and new matter.

Not only do we when observing disjunction pace out the boundary between eras in occcidental history but we also face the difficult notion of discontinuity in a temporal fabric of which we know the weave to be unbroken. Continuous form does not predicate continuous meaning, nor does continuity of form or of meaning necessarily imply continuity of culture. On the contrary prolonged continuities of form *or* meaning, on the order of a thousand years, may mask or conceal a cultural discontinuity deeper than that between classical antiquity and the middle ages. This warning holds best under conditions where literary sources are unavailable, as in the study of the older stages of the native civilizations of ancient America. Thus we may not use Aztec ritual descriptions as compiled by Sahagún about 1550 to explain murals painted at Teotihuacán a thousand years earlier, for the same reason that we would not easily get agreement in interpreting the Hellenistic images of Palmyra by using Arabic texts on Islamic ritual. The idea of disjunction not only makes every ethnological analogy questionable, by insisting upon discontinuity rather than its opposite wherever long durations are under discussion, but it also provides a serviceable explanation for the most complex mechanisms of cultural change.

—1970

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3

Microenvironments and Mesoamerican Prehistory

by Michael D. Coe and Kent V. Flannery

A crucial period in the story of the pre-Columbian cultures of the New World is the transition from a hunting-and-collecting way of life to effective village farming. We are now fairly certain that Mesoamerica[1] is the area in which this took place, and that the time span involved is from approximately 6500 to 1000 B.C., a period during which a kind of "incipient cultivation" based on a few domesticated plants, mainly maize, gradually supplemented and eventually replaced wild foods.[2] Beginning probably about 1500 B.C., and definitely by 1000 B.C., villages with all of the signs of the settled arts, such as pottery and loom-weaving, appear throughout Mesoamerica, and the foundations of pre-Columbian civilization may be said to have been established.

Much has been written about food-producing "revolutions" in both hemispheres. There is now good evidence both in the Near East and in Mesoamerica that food production was part of a relatively slow *evolution*, but there still remain several problems related to the process of settling down. For the New World, there are three questions which we would like to answer.

1) What factors favored the early development of food production in Mesoamerica as compared with other regions of this hemisphere?
2) What was the mode of life of the earlier hunting-and-collecting peoples in Mesoamerica, and in exactly what ways was it changed by the addition of cultivated plants?
3) When, where, and how did food production make it possible for the first truly sedentary villages to be established in Mesoamerica?

The first of these questions cannot be answered until botanists determine the

habits and preferred habitats of the wild ancestors of maize, beans, and the various cucurbits which were domesticated. To answer the other questions, we must reconstruct the human-ecological situations which prevailed.

Some remarkably sophisticated, multidisciplinary projects have been and still are being carried out elsewhere in the world, aimed at reconstructing prehistoric human ecology. However, for the most part they have been concerned with the adaptations of past human communities to large-scale changes in the environment over very long periods—that is, to alterations in the *macroenvironment*, generally caused by climatic fluctuations. Such alterations include the shift from tundra to boreal conditions in northern Europe. Nevertheless, there has been a growing suspicion among prehistorians that macroenvironmental changes are insufficient as an explanation of the possible causes of food production and its effects,[3] regardless of what has been written to the contrary.

Ethnography and Microenvironments

We have been impressed, in reading anthropologists' accounts of simple societies, with the fact that human communities, while in some senses limited by the macroenvironment—for instance, by deserts or by tropical forests[4]—usually exploit several or even a whole series of well-defined *microenvironments* in their quest for food.[5] These microenvironments might be defined as smaller subdivisions of large ecological zones; examples are the immediate surroundings of the ancient archeological site itself, the bank of a nearby stream, or a distant patch of forest.

An interesting case is provided by the Shoshonean bands which, until the mid-19th century, occupied territories within the Great Basin of the American West[6]. These extremely primitive peoples had a mode of life quite similar to that of the peoples of Mesoamerica of the 5th millennium B.C., who were the first to domesticate maize. The broadly limited effects of the Great Basin (which, generally speaking, is a desert) and the lack of knowledge of irrigation precluded any effective form of agriculture, even though some bands actually sowed wild grasses and one group tried an ineffective watering of wild crops. Consequently, the Great Basin aborigines remained on a hunting and plant-collecting level, with extremely low population densities and a very simple social organization. However, Steward's study[6] shows that each band was not inhabiting a mere desert but moved on a strictly followed seasonal round among a vertically and horizontally differentiated set of microenvironments, from the lowest salt flats up to piñon forest, which were ''niches'' in a human-ecological sense.

The Great Basin environment supplied the potential for cultural development or lack of it, but the men who lived there selected this or that microenvironment. Steward clearly shows that *how* and *to what* they adapted influenced many other aspects of their culture, from their technology to their settlement pattern, which was necessarily one of restricted wandering from one seasonally occupied camp to another.

Seasonal wandering would appear to be about the only possible response of a people without animal or plant husbandry to the problem of getting enough food throughout the year. Even the relatively rich salmon-fishing cultures of the Northwest Coast (British Columbia and southern Alaska) were without permanently occupied villages. Contrariwise, it has seemed to us that only a drastic reduction of the number of niches to be exploited, and a concentration of these in space, would have permitted the establishment of full-time village life. The ethnographic data suggest that an analysis of microenvironments or niches would throw much light on the processes by which the Mesoamerican peoples settled down.

Methodology

If the environment in which an ancient people lived was radically different from any known today, and especially if it included animal and plant species which are now extinct and whose behavior is consequently unknown, then any reconstruction of the subsistence activities of the people is going to be difficult. All one could hope for would be a more-or-less sound reconstruction of general ecological conditions, while a breakdown of the environment into smaller ecological niches would be impossible. However, much if not most archeological research concerns periods so recent in comparison with the million or so years of human prehistory that in most instances local conditions have not changed greatly in the interval between the periods investigated and the present.

If we assume that there is a continuity between the ancient and the modern macroenvironment in the area of interest, there are three steps which we must take in tracing the role of microenvironments.

1) Analysis of the present-day microecology (from the human point of view) of the archeological zone. Archaeological research is often carried out in remote and little-known parts of the earth, which have not been studied from the point of view of natural history. Hence, the active participation of botanists, zoologists, and other natural scientists is highly recommended.

   The modern ethnology of the region should never be neglected, for all kinds of highly relevant data on the use of surrounding niches by local people often lie immediately at hand. We have found in Mesoamerica that the workmen on the "dig" are a mine of such information. There may be little need to thumb through weighty reports on the Australian aborigines or South African Bushmen when the analogous custom can be found right under one's nose.[7] The end result of the analysis should be a map of the microenvironments defined (here aerial photographs are of great use), with detailed data on the seasonal possibilities each offers human communities on certain technological levels of development.
2) Quantitative analysis of food remains in the archeological sites, and of the technical equipment (arrow or spear points, grinding stones for seeds, baskets and other containers, and so on) related to food-getting. It is a rare site report that treats of bones and plant remains in any but the most perfunctory way. It might seem a simple thing to ship animal bones from a site to a specialist for identification, but most archeologists know that many zoologists consider identification of recent faunal remains a waste of time.[8] Because of this, and because many museum collections do not include postcranial skeletons that could be used for identification, the archeologist must arrange to secure his own comparative collection. If this collection is assembled by a zoologist on the project, a by-product of the investigation would be a faunal study of microenvironments. Similarly, identification of floral and other specimens from the site would lead to other specialized studies.
3) Correlation of the archeological with the microenvironmental study in an overall analysis of the ancient human ecology.

The Tehuacán Valley

An archeological project undertaken by R.S. MacNeish, with such a strategy in mind, has been located since 1961 in the dry Tehuacán Valley of southern Puebla, Mexico.[2,9] The valley is fringed with bone-dry caves in which the food remains of early peoples have been preserved to a remarkable degree in stratified deposits. For a

number of reasons, including the results of his past archeological work in Mesoamerica, MacNeish believed that he would find here the origins of maize agriculture in the New World, and he has been proved right. It now seems certain that the wild ancestor of maize was domesticated in the Tehuacan area some time around the beginning of the 5th millennium B.C.

While the Tehuacan environment is in general a desert, the natural scientists of the project have defined within it four microenvironments (Fig. 1).

1) *Alluvial valley floor*, a level plain sparsely covered with mesquite, grasses, and cacti, offering fairly good possibilities, especially along the Rio Salado, for primitive maize agriculture dependent on rainfall.
2) *Travertine slopes*, on the west side of the valley. This would have been a niche useful for growing maize and tomatoes and for trapping cottontail rabbits.
3) *Coxcatlan thorn forest*, with abundant seasonal crops of wild fruits, such as various species of *Opuntia*, pitahaya, and so on. There is also a seasonal abundance of whitetail deer, cottontail rabbits, and skunks, and there are some peccaries.
4) *Eroded canyons*, unsuitable for exploitation except for limited hunting of deer and as routes up to maguey fields for those peoples who chewed the leaves of that plant.

The correlation of this study with the analysis, by specialists, of the plant and animal remains (these include bones, maize cobs, chewed quids, and even feces) found in cave deposits has shown that the way of life of the New World's first farmers was not very different from that of the Great Basin aborigines in the 19th century. Even the earliest inhabitants of the valley, prior to 6500 B.C., were more collectors of seasonally gathered wild plant foods than they were "big game hunters," and they traveled in microbands in an annual, wet-season-dry-season cycle.[10] While slightly more sedentary macrobands appeared with the adoption of simple maize cultivation after 5000 B.C., these people nevertheless still followed the old pattern of moving from microenvironment to microenvironment, separating into microbands during the dry season.

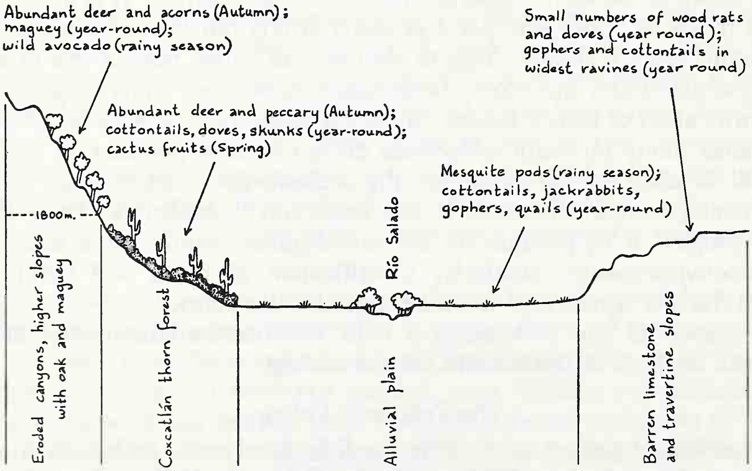

Figure 1. An idealized east-west transection of the central part of the Tehuacán Valley, Puebla, Mexico, showing microenvironments and the seasons in which the food resources are exploited. East is to the left. The length of the area represented is about 20 kilometers.

The invention and gradual improvement of agriculture seem to have made few profound alterations in the settlement pattern of the valley for many millennia. Significantly, by the Formative period (from about 1500 B.C. to A.D. 200), when agriculture based on a hybridized maize was far more important than it had been in earlier periods as a source of food energy, the pattern was still one of part-time nomadism.[11] In this part of the dry Mexican highlands, until the Classic period (about A.D. 200 to 900), when irrigation appears to have been introduced into Tehuacán, food production had still to be supplemented with extensive plant collecting and hunting.

Most of the peoples of the Formative period apparently lived in large villages on the alluvial valley floor during the wet season, from May through October of each year, for planting had to be done in May and June, and harvesting, in September and October. In the dry season, from November through February, when the trees and bushes had lost their leaves and the deer were easy to see and track, some of the population must have moved to hunting camps, principally in the Coxcatlán thorn forest. By February, hunting had become less rewarding as the now-wary deer moved as far as possible from human habitation; however, in April and May the thorn forest was still ripe for exploitation, as many kinds of wild fruit matured. In May it was again time to return to the villages on the valley floor for spring planting.

Now, in some other regions of Mesoamerica there were already, during the Formative period, fully sedentary village cultures in existence. It is clear that while the Tehuacán valley was the locus of the first domestication of maize, the origins of full-blown village life lie elsewhere. Because of the constraining effects of the macroenvironment, the Tehuacán people were exploiting, until relatively late in Mesoamerican prehistory, as widely spaced and as large a number of microenvironments as the Great Basin aborigines were exploiting in the 19th century.

Coastal Guatemala

Near the modern fishing port of Ocós, only a few kilometers from the Mexican border on the alluvial plain of the Pacific coast of Guatemala, we have found evidence for some of the oldest permanently occupied villages in Mesoamerica.[12] We have also made an extensive study of the ecology and ethnology of the Ocós area.

From this study[13] we have defined no less than eight distinct microenvironments (Fig. 2) within an area of only about 90 square kilometers. These are as follows:

1) *Beach sand and low scrub*. A narrow, infertile strip from which the present-day villagers collect occasional mollusks, a beach crab called *chichimeco* and one known as *nazareño*, and the sea turtle and its eggs.
2) *The marine estuary-and-lagoon system*, in places extending considerably inland and ultimately connecting with streams or rivers coming down from the Sierra Madre. The estuaries, with their mangrove-lined banks, make up the microenvironment richest in wild foods in the entire area. The brackish waters abound in catfish (*Arius* sp. and *Galeichthys* sp.), red snapper (*Lutjanus colorado*), several species of snook (*Centropomus* sp.), and many other kinds of fish. Within living memory, crocodiles (*Crocodylus astutus*) were common, but they have by now been hunted almost to extinction. The muddy banks of the estuaries are the habitat of many kinds of mollusks, including marsh clams (*Polymesoda radiata*), mussels (*Mytella falcata*), and oysters (*Ostrea columbiensis*), and they also support an extensive population of fiddler and mud crabs.
3) *Mangrove forest*, consisting mainly of stilt-rooted red mangrove, which slow-

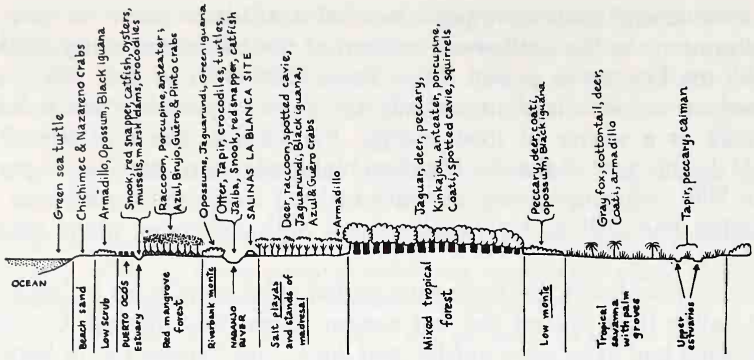

Figure 2. Northeast-southwest transection of the Ocós area of coastal Guatemala, showing microenvironments in relation to the site of Salinas La Blanca. Northeast is to the right. The length of the area represented is about 15 kilometers.

ly gives way to white mangrove as one moves away from the estuary. We noted high populations of collared anteater (*Tamandua tetradactyla*) and arboreal porcupine (*Coendu mexicanus*). A large number of crabs (we did not determine the species) inhabit this microenvironment; these include, especially, one known locally as the *azul* (blue) crab, on which a large population of raccoons feeds.

4) *Riverine*, comprising the channels and banks of the sluggish Suchiate and Naranjo rivers, which connect with the lagoon-estuary system not far from their mouths. Freshwater turtles, catfish, snook, red snapper, and mojarra (*Cichlasoma* sp.) are found in these waters; the most common animal along the banks is the green iguana (*Iguana iguana*).
5) *Salt playas*, the dried remnants of ancient lagoon-and-estuary systems which are still subject to inundation during the wet season, with localized stands of a tree known as *madresal* ("mother of salt"). Here there is an abundance of game, including whitetail deer and the black iguana (*Ctenosaura similis*), as well as a rich supply of salt.
6) *Mixed tropical forest*, found a few kilometers inland, in slightly higher and better drained situations than the salt *playas*. This forest includes mostly tropical evergreens like the ceiba, as well as various zapote and fan palms, on the fruit of which a great variety of mammals thrive—the kinkajou, the spotted cavy, the coatimundi, the raccoon, and even the gray fox. The soils here are highly suitable for maize agriculture.
7) *Tropical savannah*, occupying poorly drained patches along the upper stream and estuary systems of the area. This is the major habitat in the area for cottontail rabbits and gray foxes. Other common mammals are the coatimundi and armadillo.
8) *Cleared fields and second growth*, habitats which have been created by agriculturists, and which are generally confined to areas that were formerly mixed tropical forest.

Among the earliest Formative cultures known thus far for the Ocós area is the Cuadros phase, dated by radiocarbon analysis at about 1000 to 850 B.C. and well represented in the site of Salinas La Blanca, which we excavated in 1962.[14] The site is on the banks of the Naranjo River among a variety of microenvironments; it consists of two flattish mounds built up from deeply stratified refuse layers representing house foundations of a succession of hamlets or small villages.

From our analysis of this refuge we have a good idea of the way in which the Cuadros people lived. Much of the refuse consists of potsherds from large, neckless jars, but very few of the clay figurines that abound in other Formative cultures of Mesoamerica were found. We discovered many plant remains; luckily these had been preserved or "fossilized" through replacement of the tissues by carbonates. From these we know that the people grew and ate a nonhybridized maize considerably more advanced than the maize which was then being grown in Tehuacán.[15] The many impressions of leaves in clay floors in the site will, we hope, eventually make it possible to reconstruct the flora that immediately surrounded the village.

The identification of animal remains (Fig. 3), together with our ecological study and with the knowledge that the people had a well-developed maize agriculture, gives a great deal of information on the subsistence activities of these early coastal villagers. First of all, we believe they had no interest whatever in hunting, a conclusion reinforced by our failure to find a single projectile point in the site. The few deer bones that have been recovered are all from immature individuals that could have been encountered by chance and clubbed to death. Most of the other remains are of animals that could have been collected in the environs of the village, specifically in the lagoon-estuary system and the flanking mangrove forest, where the people fished, dug for marsh clams, and, above all, caught crabs (primarily the *azul* crab, which is trapped at night). Entirely missing are many edible species found in other micro-environments, such as raccoon, cottontail rabbit, peccary, spotted cavy, and nine-banded armadillo.

There is no evidence at all that occupation of Salinas La Blanca was seasonal. An effective food production carried out on the rich, deep soils of the mixed tropical forest zone, together with the food resources of the lagoon-estuary system, made a permanently settled life possible. Looked at another way, developed maize agriculture had so reduced the number and spacing of the niches which had to be exploited that villages could be occupied the year round.[16]

Conditions similar to those of the Ocós area are found all along the Pacific Coast of Guatemala and along the Gulf Coast of southern Veracruz and Tabasco in Mexico, and we suggest that the real transition to village life took place there and not in the dry Mexican highlands, where maize was domesticated initially.[17]

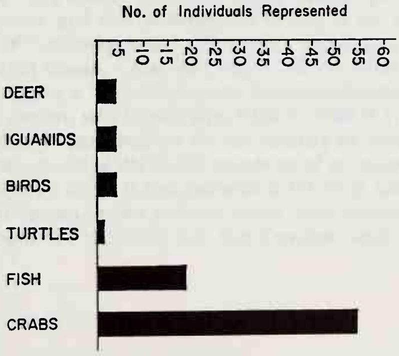

Figure 3. Animal remains, exclusive of mollusks, found in Cuadros phase levels at Salinas La Blanca.

Conclusion

The interpretation of archeological remains through a fine-scale analysis of small ecological zones throws new light on the move toward sedentary life in Mesoamerican prehistory. In our terms, the basic difference between peoples who subsist on wild foods and those who dwell in permanent villages is that the former must exploit a wide variety of small ecological niches in a seasonal pattern—niches which are usually scattered over a wide range of territory—while the latter may, because of an effective food production, concentrate on one or on only a few microenvironments which lie relatively close at hand.

Fine-scale ecological analysis indicates that there never was any such thing as an ''agricultural revolution'' in Mesoamerica, suddenly and almost miraculously resulting in village life. The gradual addition of domesticates such as maize, beans, and squash to the diet of wild plant and animal foods hardly changed the way of life of the Tehuacán people for many thousands of years, owing to a general paucity of the environment, and seasonal nomadism persisted until the introduction of irrigation. It probably was not until maize was taken to the alluvial, lowland littoral of Mesoamerica, perhaps around 1500 B.C., that permanently occupied villages became possible, through reduction of the number of microenvironments to which men had to adapt themselves.

—1964

References and Notes

1. Mesoamerica is the name given to that part of Mexico and Central America which was civilized in pre-Columbian times. For an excellent summary of its prehistory, see G. R. Willey, *Science* **131**, 73 (1960).
2. R. S. MacNeish, *Science* **143**, 531 (1964).
3. See C. A. Reed and R. J. Braidwood, "Toward the reconstruction of the environmental sequence of Northeastern Iraq," in R. J. Braidwood and B. Howe, "Prehistoric Investigations in Iraqi Kurdistan," *Oriental Institute, University of Chicago, Studies in Ancient Oriental Civilization No. 31* (1960), p. 163. Reed and Braidwood also convincingly reject the technological-deterministic approach of V. G. Childe and his followers.
4. See B. J. Meggers, *Am. Anthropologist* **56**, 801 (1954), for an environmental-deterministic view of the constraining effects of tropical forests on human cultures.
5. See F. Barth, *ibid.* **58**, 1079 (1956), for a microenvironmental approach by an ethnologist to the exceedingly complex interrelationships between sedentary agriculturists, agriculturists practicing transhumant herding, and nomadic herders in the state of Swat, Pakistan.
6. J. H. Steward, "Basin-Plateau Aboriginal Sociopolitical Groups," *Smithsonian Inst. Bur. Am. Ethnol. Bull. 120* (1938).
7. The pitfalls of searching for ethnological data relevant to archeological problems among cultures far-flung in time and space are stressed by J. G. D. Clark, *Prehistoric Europe, The Economic Basis* (Philosophical Library, New York, (1952), p. 3.
8. See W. W. Taylor, Ed., "The identification of non-artifactual archaeological materials," *Natl. Acad. Sci.-Natl. Res. Council Publ. 565* (1957). For a general article on the analysis of food remains in archeological deposits see R. F. Heizer in "Application of quantitative methods in archaeology," *Viking Fund Publications in Anthropology No. 28* (1960), pp. 93-157.
9. P. C. Mangelsdorf, R. S. MacNeish, W. C. Gallinat, *Science* **143**, 538 (1964). We thank Dr. MacNeish for permission to use unpublished data of the Tehuacán Archaeological-Botanical Project in this article.
10. R. S. MacNeish, *Second Annual Report of the Tehuacán Archaeological-Botanical Project* (Robert S. Peabody Foundation for Archaeology, Andover, Mass., 1962).
11. The research discussed in this and the following paragraph was carried out by Flannery as staff zoologist for the Tehuacán project during the field seasons of 1962 and 1963; see K. V. Flannery, "Vertebrate Fauna and Prehistoric Hunting Patterns in the Tehuacán Valley" (Robert S. Peabody Foundation for Archaeology, Andover, Mass., in press); ______________, thesis, Univ. of Chicago, in preparation.
12. M. D. Coe, "La Victoria, an early site on the Pacific Coast of Guatemala," *Peabody Museum, Harvard, Papers No. 53* (1961).
13. The study was carried out largely by Flannery.
14. The final report on Salinas La Blanca by Coe and Flannery is in preparation. The research was supported by the National Science Foundation under a grant to the Institute of Andean Research, as part of the program "Interrelationships of New World Cultures." The oldest culture in the area is the Ocós phase, which has complex ceramics and figurines; the paleoecology of Ocós is less well known than that of Cuadros, which directly follows it in time.
15. P. C. Mangelsdorf, who has very kindly examined these maize specimens, informs us that they are uncontaminated with *Tripsacum*, and that probably all belong to the primitive lowland race, Nal-Tel.
16. To paraphrase the concept of "primary forest efficiency," developed by J. R. Caldwell ["Trend and Tradition in the Eastern United States," *Am. Anthropol. Assoc. Mem. No. 88* (1958)], we might think of the Cuadros phase as leaning to a "primary lagoon-estuary efficiency." We might think the same of the Ocós phase of the same region, which may date back to 1500 B.C.
17. An additional factor which may in part account for the priority of coastal Guatemala over Tehuacán in the achievement of a sedentary mode of life is the presence of an extensive system of waterways in the former region, which might have made it less necessary for local communities to move to productive sources of food. By means of canoes, a few persons could have brought the products of other niches to the village. However, our evidence indicates that the Cuadros people largely ignored the possibilities of exploiting distant niches.

4

Cultural Ecology of Nuclear Mesoamerica

by William T. Sanders

The following paper is an attempt to define some of the interrelationships between culture and environment and to demonstrate the value of the concepts of cultural ecology in understanding the process of development of pre-Iron Age civilizations. By cultural ecology I mean simply the study of the interaction of cultural processes with the physical environment. My theoretical position may be stated in the following principles:

1) Each environment offers to human occupation a different set of challenges, and therefore a different set of alternate cultural responses may be expected. There is, of course, some overlapping of both challenges and cultural solutions from environment to environment. One can also say that certain alternative responses are more likely to occur than others. Some of these responses may be technological, others social, and some even religious.
2) In responding to such challenges, cultural response tends to take the path of greatest efficiency in the utilization of the environment.
3) In development of any conceptual scheme in culturology, the environment should be considered as an active, integrated part of the cultural system not as a passive extra-cultural factor.

To most archeologists the term "civilization" has a relatively restricted meaning. Kroeber uses the term more broadly, and even synonymously with "culture," defining it in terms of his pattern concept, and calling it the "total cultural pattern." In this paper I will use the term in the more restricted sense of the archeologist.

A civilization is a particular kind of cultural pattern; as contrasted to cultures as a whole its pattern is broader, less narrowly restricted, and therefore capable of greater

elaboration (see Kroeber 1948:311-43). When one views the growth configuration of a civilization one is impressed by its dynamic quality. All cultures change, but in civilizations change is more rapid, more easily measured, and more apparent to the observer. Certain conditions preclude the development of this type of cultural growth; some of them link specifically with the utilization of the environment. These may be enumerated as follows: 1) an effective utilization of natural resources permitting a relatively dense population; (2) the integration of such resources, natural and demographic, into a relatively large society; (3) a system of social stratification, at least on two levels, in which the surplus production of a large majority is systematically accumulated, controlled, and diverted into culturally specified channels by a small dominant minority.

This third condition seems to be an essential one as we have numerous examples of areas of the world with dense populations, relatively large social groupings, but no systematic manipulations of surplus labor and goods. In the earliest civilizations of the New and Old Worlds, this surplus was apparently controlled first by a priestly bureaucracy and directed towards the construction and glorification of buildings dedicated to the gods. Later periods saw the control exercised by, or at least shared by, a secular ruling class. Archeologists recognize civilizations primarily by the tangible results of the ''direction of surplus energy,'' in the form of permanent architecture and an exceptionally high development of skill in other areas of technology. They use technology as a guide for obvious reasons. There is often a striking difference in the quality of the technology of the folk society that produces the surplus and that of the dominant minority that controls it. Furthermore, although few studies have actually been made, we usually find much greater stability and less dynamism on the folk level.

Before the development of the proletarian metal-iron, and the beginnings of the use of metal tools by both levels in the society, this kind of culture had an extremely limited distribution in the Old World. Its primary area was a large, nearly continuous region embracing the Near East, northwest India, northeast Africa, and southeastern Europe. A secondary, historically derived and later development occurred in North China.

Furthermore, the maximal development of the pre-Iron Age civilizations was in four small areas: the Nile valley in Egypt, the Tigris Euphrates valleys in Iraq, the Indus valley in India, and the Hwango Ho valley in China, in all cases associated with a major river valley. Each of these centers was a relatively small, compact, densely populated area; the entire Old Kingdom of Egypt, for example, embraced only about 10,000 square miles of territory.

If we look at the ecological settings of the early civilizations, certain fundamental patterns emerge. The environments can be classed into two major types; (1) nearly rainless deserts with exotic major rivers, or (2), semi-arid country with low annual rainfall concentrated in a single season. In the Near East the latter climate falls generally into the type called ''Mediterranean'' with winter rains; in North China the rainy season falls in the summer. Average annual rainfall in the areas of dense population varies from 200-1,000mm. In the Near Eastern center another significant characteristic is that there is a great deal of ecological diversity based on altitude and microvariations in climate.

The geographical conditions that seem to be crucial in these centers of the civilizations were: (1) presence of a fertile soil capable of being intensively cultivated and sufficient water for irrigation, and (2), scanty plant cover which could be easily controlled (conditions (1) and (2) permitted an effective and intensive use of the land by a

peasant population with an essentially Neolithic technology); (3) presence of a major river providing a natural transportation artery, and (4), a general deficiency of natural resources other than good agricultural land (acting as a stimulus to trade).

The situation in an area such as Mesopotamia offers a unique set of problems to a farmer equipped with a neolithic technology. It is an ecological region of enormous potential, even with a relatively feeble technology. What it does require for successful utilization is a highly organized and cooperative society capable of mass effort in converting swamps and deserts into irrigated cropland. The most effective way to exploit such an environment is the development of a social system of the type we have defined as civilization.

Following V. Gordon Childe's analysis of the spread of civilization from the river valleys into the semi-arid highlands and small coastal plains of the rest of the Near East (1951, 1954), it seems to have occurred primarily as a response to ecological condition number (4). The lack of resources in the major river valleys, he argues, led to the establishment of major trade routes, towns grew up at their termini which in turn were the foci of the extended Near Eastern civilization. Furthermore, the expansion occurred into an area where the environmental conditions permitted intensive and/or specialized (olives, dates, grapes, etc.) agriculture, on a small scale.

In the Old World another process developed hand in hand with civilization—urbanization. We have purposely kept the two processes separate for reasons to be made explicit later.

I define urbanization as a process of evolution of rural communities into urban communities and further define an urban community as possessing the following attributes:

(1) Nucleation—in my analysis of modern urban communities in Mexico, all have population densities exceeding 2,000 persons per sq. km.
(2) Relatively large size—in another study, based on modern Mexico (Sanders 1956), I use a specific figure in defining towns and cities, but precise population sizes would not apply to all areas of the world. I would generally state that urban communities would have at least 2,000 to 3,000 inhabitants, and reserve the term city for those with populations exceeding 10,000.
(3) Most of the population are nonfood producers, or at least only part-time food producers, and the majority of the population is composed of part- and full-time specialists in the production and distribution of technology, regulation of social interaction, or administration of services to the supernatural.
(4) A great deal of social differentiation based on occupation, status, control of power, and in some cases, ethnic diversity. In the early development of urban centers in the Near East, the larger communities were political and religious centers, as well as commercial and industrial communities, and the growth of cities was a process directly linked to the growth of the state.

Having set the stage, in terms of basic concepts, definitions, and events in the Old World, I will now attempt to apply these concepts to the New World. As far as present research indicates, the civilizations of the New World developed independently from those of the Old World, from the same kind of folk technological base, thus providing us with a good laboratory test of the above concepts.

Cultures possessing the attributes of civilization occurred in the New World in two regions, the Mesoamerican and the Andean. The fundamental ecological patterns in the Andean region, in terms of the essential factors that permit the development of a civilization comparable to that of the Near East, correspond to a striking degree. In Peru, the heart of the Andean region, there are three primary, parallel, narrow, north-

south ecological strips. To the east is a humid, slope and foothill zone with exuberant tropical forest cover. In the center is a high mountainous region with numerous small and large valleys and basins varying in altitude from 5,000 to 13,000 feet above sea level. All over this strip the climatic type is similar to our type (2) in the Near East, light to moderate rainfall concentrated in the summer season. Average rainfall over the area varies from 500-750 mm a year. To the west is a nearly rainless desert crossed east to west by some 25 streams which have their sources in the mountains and flow to the sea, each providing water for a small, compact irrigated plain and isolated from other systems by intervening deserts. The Andean civilization centered in the mountain and desert strip and apparently never penetrated the eastern forest with any degree of success. The ecological principles of the Old World apparently may be applied very successfully to the Andean area, and along the coastal desert, at least, urbanization correlated in its development with civilization.

I will now turn to my primary area of interest and research—Mesoamerica. Here the interrelationships between environment and culture are much more complex. The area is ecologically much more diverse than any other region where pre-Iron Age civilizations have developed. Rainfall varies from 300 mm in southeastern Puebla to over 5,000 mm in the northeastern escarpment of Chiapas. Altitude varies from sea level to 2,800 m (in the area of dense human population) with a corresponding great range of temperature. Vegetation varies from near desert conditions to lush tropical rain forest, soils from siernozems to laterites, hydrography from no surface drainage to small flood season streams, to great rivers with huge tributary basins and extensive flood plains. Within this over-all diversity, in terms of problems faced by neolithic farmers, two well-defined ecological patterns emerge: (1) a Lowland pattern with heavy rainfall, exuberant vegetation, lower density and more scattered population, with slash and burn cultivation of basic foodstuffs and orchard cultivation of commercial crops; and (2), a Highland pattern with low rainfall, scanty vegetation, dense population living in larger nucleated communities and practicing intensive agriculture.

In actual fact, parts of the Lowlands have subhumid climates, and parts of the Highlands, humid climates, and any detailed analysis of the area should consider these exceptions.

In 1519, the Mesoamerican variant of civilization occurred over the entire region in all of the various ecological zones, including both Highlands and Lowlands. Urbanism, however, has been demonstrated as a corollary trait only in the Highland province, and in reality only definitely in the Central Plateau or Mesa Central of Mexico. In a more expanded paper, to be published in the projected Handbook about Mesoamerican Indians, I have analyzed in detail the role of this area in the development of urbanism and civilization in Mesoamerica. We will present here some of the results of this analysis and apply our basic concepts from Old World archeology.

Within the plateau is a small, compact, centrally located zone we will call the Nuclear Area because of its cultural dominance in the history of Mesoamerica. It includes the Valley of Mexico, Valley of Morelos, and the upper Atoyac-Nejapa drainage basin in Tlaxcala—Western Puebla, an area of approximately 20,000 km. In 1519, 20 percent of the population of Mesoamerica resided in this demographic heartland, approximately 2½ million people. Both Pan-Mesoamerican empires, Aztec and Toltec, had their capitals in this area, and earlier Teotihuacán seems to have been the center of a third, similar state. It is also one of the main contenders for the scene of the origins of American Indian agriculture and Mesoamerican civilization.

The annual rainfall in the area of heavy human occupation is everywhere below 1,000 mm , generally ranging from 500-800 mm , most of which falls in the summer

months. Vegetation cover is sparse and presents no serious challenge to primitive farmers. Within the fundamental unity is a great deal of diversity based upon altitudes ranging from 800 m to 2,800 m above sea level, in some parts of the area over a distance of only 50-60 km. Every agricultural plant in the Mesoamerican complex may be grown in some part of the area, and agricultural specialization has probably always been a distinctive feature. Soils generally are classed by Mexican agronomists as Chestnuts or Chernozems and with relatively simple techniques of soil restoration have sustained nearly continuous cropping for at least 3,500 years. The ecology generally is similar to type (2) in the Near East. There is no single great river system (although most of the area is drained by tributaries of the Balsas river) that could have served a single integrated irrigation system or provided a single transportation artery. In the Valley of Mexico, however, where two-thirds of the population resided in 1519, there was a chain of lakes that played the same role as the rivers in Old World centers of civilization.

Having described the general environmental factors of the area, let us now examine them as operational factors in the evolution of urban civilization. In the discussion we will refer back to our previous definitions of urbanization and civilization, and here, as in the Near East, the two processes were correlative and simultaneous.

(1) The ecological conditions noted above are optimal for the development of an intensive system of agriculture. Studies by Palerm (1954, 1955),* Wolf (1955), Millon (1957), Armillas (1949, 1950) and myself (ms) have demonstrated conclusively that agriculture in 1519 was as intensive as in the great centers of the Old World civilizations. The combination of low rainfall, easily controlled natural vegetation, fertile soils, water resources (lakes, springs, flood water, melt water from glaciers), and generally limited flat terrain made almost imperative the development of such techniques of soil and water conservation as permanent irrigation, chinampas, flood water irrigation, cajete planting, stone and maguey terracing, and fertilization. In the strip above 2,000 m the possibilities of early frost and retarded rainy season made irrigation necessary for really effective cultivation, even though 500-800 mm of summer rains would ordinarily be ample. The application of this body of practices resulted in an extremely dense population as contrasted to other areas of Mesoamerica. I have postulated that civilizations with a Neolithic technological base can only develop with a relatively dense population. I furthermore insist that urbanization can develop only under even more demanding demographic conditions, especially in Mesoamerica, with hand tillage. I doubt that the neolithic farmer with hand tools can produce more than a 20 percent surplus. A city of 100,000 population would require a rural population of 500,000 to support it. In the history of the Nuclear Area, two cities, Tenochtitlan and Teotihuacán reached that size.

(2) One of the attributes of an urban community is nucleation. In Gordon Childe's analysis of Mesopotamia (1954), he discusses the process as one of increasing size and social complexity from the Neolithic village to the Copper Age town to the Bronze Age city. In this concept the process begins with a small nucleated community. In terms of the *origin* of urban societies the presence of a rural population living in nucleated as opposed to dispersed communities seems to me a necessary requirement for such a development. Furthermore, in the transition period of growth from village to city, agriculture con-

*Dr. Palerm's 1955 paper cited is reprinted in this reader.—*J.A.G.*

tinued as the primary base, so that intensive agriculture would seem to be a necessary condition for such demographic growth, since the agricultural land still remains relatively accessible even when the population runs into the thousands. My analysis of rural settlement patterns in modern Mesoamerica and documentary and archeological studies of the pre-Hispanic periods, suggests that the rural settlement pattern in our Nuclear Area from the early pre-Classic to the modern period was basically one of nucleated villages. In the Nuclear Area today the degree of nucleation of the rural community correlates directly with the intensity of agriculture.

(3) One of the characteristic features of our Nuclear Area, as was stated previously, is ecological diversity. This is true of most of the Mesoamerican Highlands. At the time of the conquest and in some of the Highlands today we find an intensive development of regional trade and specialization on a rural community level. As Sol Tax (1952) has pointed out, in the Highlands of southwestern Guatemala, rural communities depend as much on trade for their livelihood as do cities. Although geographical diversity is of course not the only factor involved in this development, certainly it has acted as a powerful stimulus. If we argue that urbanization developed basically out of the agricultural folk society that supported it, and economic specialization is one of the more characteristic traits of urbanization, then the process by which urbanism evolved in Central Mexico seems apparent. Some urban communities grew up at crucial places, in terms of transportation, such as lake shore termini (Chalco) and altitude strips on the border of the Tierra Templada-Tierra Fria. Furthermore, in terms of the origins of cities and towns as centers of trade and craft specialization, the closeness of ecological zoning in Mesoamerica was an important precondition because of the primitiveness of land transportation.

(4) One of the major problems in Mesoamerica as a whole in the support of urban communities was the feeble development of transportation technology. By land, all cargo was hauled by human carriers so that only the closeness of ecological zoning permitted a relatively close spacing of markets and a heavy volume of trade. The chain of lakes in the Valley of Mexico provided a powerful stimulus to trade and undoubtedly was one of the crucial factors in the development of urbanism.

(5) Palerm, Wolf, Millon and Armillas in various papers have attempted to apply the concept of the Irrigation State to the Nuclear Area, but, thus far, with inconclusive results. One of the major problems in setting up a theoretical construct is purely archeological, the lack of data on the age of irrigation in the area. We know, on the basis of documentary and archeological evidence, that it was of great significance during the Aztec period; but it has not been specifically established for the Teotihuacán period where we have evidence for the first large state and urban community in the area. One important difference between our area and the center of Old World civilization is in the hydrographic pattern. In the Nuclear Area there are a great number of separate systems, each of which during the Aztec period provided water for a small, distinct, integrated irrigated system. Of interest with respect to this is the fact that the city state, made up of a small urban town and its dependent villages, was the largest *stable* political grouping. This is in contrast to Egypt where the normal pattern was political unification of the entire river valley. Supra-city state aggregations did occur several times in the

Nuclear Area, but the constituent city states maintained their separate political and social structure and were never integrated into a state of the Egyptian type.

I am not arguing here, of course, that political states of the size of ancient Egypt, or even larger, could not exist in the environment of Central Mexico (the case of the Inca of Peru obviously makes this position untenable). What I am saying is that, in this type of ecology, city-state political integration is the largest level that one can link directly with ecological factors. Palerm and Wolf, in a brilliant essay on the rise of the state of Acolhuacan on the east shore of the lake in the Valley of Mexico, have pointed out the subtle interrelationships between environment, agricultural technology, and socio-political systems (Wolf and Palerm 1955). In this case they postulated the integrative effects of irrigation on the state, but went further and demonstrated, in this area, that the state, once created, regardless of the factors that produced it, acted as a sponsor of extensive irrigation works and as a mechanism of producing a surplus to strengthen its power and further integrate the socio-economic system.

(6) The Nuclear Area is chronically one of overpopulation, a characteristic feature of mountain countries. Population clusters are isolated by high ranges and barren hills into separate compartments. Good flat land is premium land and never abundant so that the topography has always presented serious obstacles to an expanding population. This problem was met by improvement of agricultural technology, but, I suspect, that by Teotihuacán times the basic inventions had all been completed, except probably chinampa agriculture. It could also be met by social techniques, such as a thorough integration of the population by a system of centralized control for the construction of hydraulic works, terraces, and expansion into marginal lands.

Trade itself is one way of meeting the problem, since maguey, a staple food, can grow on even the most barren hillsides, and specialization of crop production would further increase the efficiency of land use. Spanish descriptions of the control of agriculture by the state suggest that, in fact, by 1519 such social techniques were practiced. Another response is, of course, war, conflict, and conquest between the city states and the expropriation of lands or systematic taxation of conquered groups. This in turn would of course strengthen the power of the state and was one of the factors responsible for the growth of towns into cities. Cook, in an article on Mesoamerican demography, considered war as a demographic safety valve along with human sacrifice.

It has only been in relatively recent times that the concepts of Old World culture history have been applied to Mesoamerica, under the leadership of Julian Steward in the United States and Pedro Armillas in Mexico. H. J. Spinden (1928) anticipated this recent development in the 1920's, but he remains a lone pioneer. The lack of such attempts between the years 1930-1950 demands some explanation, since this period was an exceedingly productive one in basic research in Mesoamerican archeology. The primary reason was undoubtedly the development of research in the Maya Lowlands, where archeological exploration revealed the presence of an extraordinarily rich regional variant of Mesoamerican civilization in a humid forested lowland plain. This discouraged attempts to relate the growth of the civilization to environmental factors. Such research developments furthermore tended to obscure the fact that most of Mesoamerica is, in fact, a sub-humid area. Excluding most of the Yucatan Penin-

sula, parts of the Gulf Coast, narrow strips of escarpment, a few small segments of the Pacific coast, and parts of the Guatemala Highlands, rainfall over most of this huge area is either less than 1,000 mm a year, or is so irregular from year to year that some techniques of humidity conservation are necessary for an effective enough system of agriculture to provide the demographic basis of a civilization.

The primary agricultural system in most of Lowland Mesoamerica is one called variously in the literature slash and burn, swidden, shifting cultivation, and, in Mexico, roza. It is a system practiced all over the world in tropical areas and, even where iron tools are used, it tends to be correlated with a low population density and a simple folk rural society residing in small, socially autonomous communities. This generalization is even more valid if we apply it to cultures with neolithic technologies. A variant of it was apparently practiced by neolithic societies in humid northern environments as well (northern and central Europe, eastern U.S.) (Childe 1951).

In the New World, outside of Mesoamerica, this system of farming was practiced all over the lowlands of eastern South America and around the Caribbean; and nowhere in this huge area was it the base of a culture of the type we are calling civilization.

The occurrence of Mesoamerican civilization in the tropical lowlands of Mesoamerica, based on slash and burn agriculture, is a unique one and demands further explanation. On the basis of published settlement pattern studies in the Petén and my own studies in northern Yucatan, Tabasco, central Vera Cruz, and the Huasteca, one can say that urbanism was not a correlative trait with civilization in those areas. The density of housemounds at sites such as Tikal, Uaxactún, Chichén Itzá, and the Puuc sites is well within the range of a rural, or at least surburban, population. Bullard (1960), in his survey of a large area of the northern Petén, found a surprising lack of correspondence of house clusters to major ceremonial complexes. Apparently the settlement pattern was composed of two basic social levels: (1) a ceremonial center with a small resident priest-craftsman population as the dominant level, and (2) hundreds of small dependent rural hamlets occurring in a nearly continuous distribution between the ceremonial centers. This demographic and social pattern clearly relates to slash and burn agriculture and the primitiveness of Mesoamerican transportation. Apparently the system will permit a dense enough population to support a civilization of the Mesoamerican type but not urbanism, and the demands of this system for space tend to produce a dispersed agricultural population.

In recent years there has been a gradual crystallization of two opposed theoretical positions in the interpretation of the culture history of Mesoamerica: (1) in one position the area of the birth and early development is thought to have occurred in the humid lowlands based on slash and burn agriculture; (2) in the other, the development of civilization is seen as a corollary process with urbanization and occurring first in some part of the sub-humid highlands with intensive agriculture. It is postulated that it then spread into the humid lowlands where, because of the ecological conditions, the development of urbanism was aborted.

Archeological data per se cannot, at the present state of knowledge, resolve the conflict one way or the other. I have, of course, as the previous discussion indicates, accepted this latter approach. Specifically my position may be elaborated in the following points:

(1) Mesoamerican civilization developed first in Central Mexico as a corollary process with urbanization.

(2) This kind of culture which we are calling civilization must have its roots in the folk society, that was its basal level and required the special kind of folk

society that intensive agriculture produces. I see very little in the character or personality of a slash and burn folk society or economy that would lead to the development of civilization.

(3) The spread of Mesoamerican civilization into the lowlands was a process directly related to the regional pattern of specialization and symbiosis we discussed previously. As civilizations expanded in the highlands and immediate lowland strips, then the trade orbits were extended all the way to the coast and all of the lowland province shared in the general civilization. This did not occur in the Andean region, primarily because there was a lowland strip along the Pacific coast which had the proper ecological conditions for intensive agriculture. In Mesoamerica, subhumid lowland areas were more restricted in extent and so the humid areas were incorporated.

(4) The spread of Mesoamerican civilization into the humid lowlands was only a partial success, as the spectacular collapse of the Petén Maya civilization demonstrates. The fall of Maya civilization was qualitatively different from the fall of the contemporary Classic civilization of Teotihuacán. In the case of the latter, newer and equally vigorous civilizations replaced it, and the collapse occurred only in the upper, urban level. All of the evidence, archeological and documentary, in the Petén demonstrates that there not only the upper level but the folk agricultural society collapsed as well. There is very little evidence of a post-Classic population in the area, and Spanish records give one the impression that the population of the 16th century was nearly as sparse as the modern.

—1962

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5

The Second Mammoth and Associated Artifacts At Santa Isabel Iztapan, Mexico*

by Luis Aveleyra A. de Anda

Among the numerous problems still to be resolved in the archaeology of Mexico, one could not find a more captivating, more fundamental, and at the same time, less known one, than the early genesis of the native civilizations of Mesoamerica. Lack of knowledge of preceramic developments, which are the truly *formative* ones of the high pre-Hispanic cultures, leaves the whole complicated sequence of better-studied civilizations without a real foundation. The investigation of this field requires collaborative research in the geological and paleontological sciences.

Curiously enough, these initial phases of prehistory in Mexico, in which a great scarcity of data is to be expected, already reveal a cultural picture of a definite form. The existence of a level of nomadic hunters of paleolithic type, at the end of the Pleistocene and within a natural environment different from the present in landscape, flora, and fauna, has been established definitely in the Valley of Mexico, and furnishes a point of departure for the study of human activity in the center of the country.

The present work reports a new discovery related to this phase of prehistory in the Valley of Mexico. The results obtained are not new, but rather, complementary to previous investigations. The coexistence of man and fauna now extinct in this region was already indicated in the recent work of Mexican and foreign geologists (Arellano

*Based upon Aveleyra's *El Segundo Mamut Fósil de Santa Isabel Iztapan, México y Artefactos Asociados* (Publicaciones de la Dirección de Prehistoria, No. 1, Instituto Nacional de Antropología e Historia, Mexico, 1955). Translated and abridged by Alex D. Krieger. For more extended explanations, and especially for numerous fine photographs of the different stages of excavation, see the original.

1946a; Bryan 1946, 1948; de Terra 1946, 1949), and confirmed later by investigations and findings of the Dirección de Prehistoria of the Instituto Nacional de Antropología e Historia (Maldonado-Koerdell and Aveleyra 1949; Aveleyra and Maldonado-Koerdell 1952, 1953; Martínez del Río 1952).

Antecedents

The extraordinary prehistoric riches in the vicinity of Tepexpan in the northeast part of the Valley of Mexico, and the associations obtained there of man and fauna in the Pleistocene, render this zone one of the most important on the continent for the study of "paleo-Indian" cultures. Since more than a century and a half ago discoveries of fossil skeletal remains exposed in the plain of Tepexpan and adjacent sites have been made, but have been reported mainly in popular style in newspapers and magazines. Scientific information is, unfortunately, very scarce (Reyes 1923, 1927; Díaz Lozano 1927; Arellano 1946b). The findings of Reyes and Díaz Lozano are not very illustrative of human prehistory in the region, due perhaps to the exploratory techniques directed, from the paleontological point of view, at recovering fossils purely for their taxonomic and museum value. In the case of the mammoth skeleton excavated by Arellano (1946b) a possible association with an obsidian flake is mentioned.

In 1947 the discovery of Tepexpan Man, the first fossil human remains found in Mexico and one of the most remarkable discoveries in America, crowned the patient labor of Arellano and Bryan in the sediments of the Valley, and the integration of these problems achieved by Helmut de Terra.

The finding of Tepexpan Man aroused doubts about its authenticity in certain foreign circles, based principally on faults of observation on the part of the discoverers, and on some methodological dogmas in details of the exploration. This rigorous criticism, it must be warned, although well justified, was the product of a "tele-appreciation" of the facts, and without the appropriate knowledge of the series of previous investigations done by de Terra which were forming a perfectly clear picture of the geological, glacial, and lacustrine landscape of the region. Discoveries achieved a few years later bore out de Terra's belief in the existence of man as the hunter of mammoths in the Valley of Mexico at the end of the Pleistocene.

In 1952, only a few days after the Dirección de Prehistoria initiated its first field work, it was rewarded with the lucky finding of the first fossil mammoth at Santa Isabel Iztapan, scarcely 2 km from the site of Tepexpan Man (Aveleyra and Maldonado-Koerdell 1952, 1953) and about 20 km northeast of Mexico City. In direct association were six implements of stone, adding in a remarkable way to the picture of prehistoric man as a hunter of mammoths in this vicinity. The presence, in the plain of Tepexpan and nearby sites, of not less than a dozen skeletal remains of mammoth (including the findings of Reyes, Díaz Lozano, Arellano, and others), together with the new discoveries of Tepexpan Man and the first mammoth at Iztapan, all of them in a limited area, was a sure indication that toward the end of the Pleistocene, the zone of Tepexpan-Iztapan must have been the scene of systematic mammoth hunting on the edge of ancient Lake Texcoco.

The discovery of the second mammoth at Santa Isabel Iztapan also resulted from the plans for exploration of the Dirección de Prehistoria in this region. At the beginning of excavation of the first mammoth in March, 1952, a special effort was made to encourage local people and authorities to inform the Dirección about all "giant bones" they would find when excavating ditches and wells. At the end of May, 1954, notice was received of large bones found in digging an irrigation ditch in the village of

Santa Isabel Iztapan. On inspecting the place it was proved that the bones in view were *in situ* and consisted of a portion of the base of the cranium and the proximal sectors of both tusks of a mammoth. Fortunately in this case, unlike the case of the first mammoth in which the cranium was destroyed by the local people when trying to extract it, the parts originally discovered were left in place and protected until the arrival of the Dirección de Prehistoria. The only pieces removed from their original place were both upper molars (the first part of the skeleton which the picks encountered on deepening the ditch) which were kept in a safe place and later given to the author.

The exploration began on June 1, 1954, and ended on the 12th. The author and Arturo Romano Pacheco, physical anthropologist of the Dirección, to whom should be credited the unsurpassed excavation technique employed, were in charge of the exploration. Manuel Maldonado-Koerdell was in charge of the geological study (see Appendix) and collaborated actively in the excavation, as did a student of the Escuela Nacional de Antropología e Historia, Francisco Gonzáles Rul. In some phases of the exploration we also had the help of Pablo Martínez del Río, Joaquín Cortina Goríbar, and the students Lilia Trejo de la Rosa, Mónica Bopp, and Carmen Block.

We must acknowledge the invaluable financial help received from several persons: the important annual subsidy received from Petróleos Mexicanos through its director, Antonio J. Bermúdez, has been indispensable to almost all the investigations achieved by the Dirección since the date of its foundation; the sum annually donated by Bruno Pagliai beginning in 1955 will permit the Dirección to devote full time to the works related to the prehistory of Mexico; and to Gilberto Loyo, Secretario de Economía Nacional, are due the legal procedures which culminated in the acquisition of additional mobile equipment. José Kimball took the photographs of the artifacts. Most of the other photographs were taken by the anthropologist Arturo Romano. Miguel Ricardez, cartographer of the Secretaría de la Defensa Nacional, kindly prepared the map of the region which is included here (Fig. 1). Finally, it is necessary to mention the decisive collaboration of the local authorities of Santa Isabel Iztapan, especially the enthusiastic help of the brothers José and Rosendo Cortés, who originally reported the finding and made possible the exploration on their property.

Location of the Discovery and Local Topography

The second mammoth at Iztapan was found approximately 350 m south of the first one (Aveleyra and Maldonado-Koerdell 1952), and some 2600 m south (and slightly west) of the site of Tepexpan Man (Fig. 1). The locality, together with the plain of Tepexpan toward the north and the surrounding terrain, forms part of the great sloping plain resulting from the retreat of the waters of the present Lake Texcoco in its northeast portion. The plain shows all the distinctive characteristics of the ancient lacustrine deposits except where modern cultivation has modified the surface of the terrain. In the surroundings of Santa Isabel Iztapan and the neighboring town of Tequisistlán there are plots of maize and vegetables, and some isolated *ahuejote* trees which may indicate the presence of pre-Hispanic chinampas in the region. The non-cultivated zones, such as the plain of Tepexpan, are covered by thin, coarse pasture, dotted with alkali spots bare of vegetation.

The most important nearby elevations are located to the north and northeast of the site. These are the hills of Chiconautla and Tlahuilco, formed by volcanic breccia, ashes, and lava flows. Precisely on the slopes of these hills were located the prehistoric shores which correspond to the Pleistocene levels of the Lake Texcoco. The hill of Chiconautla with an elevation of 2630 m forms the eastern margin of the

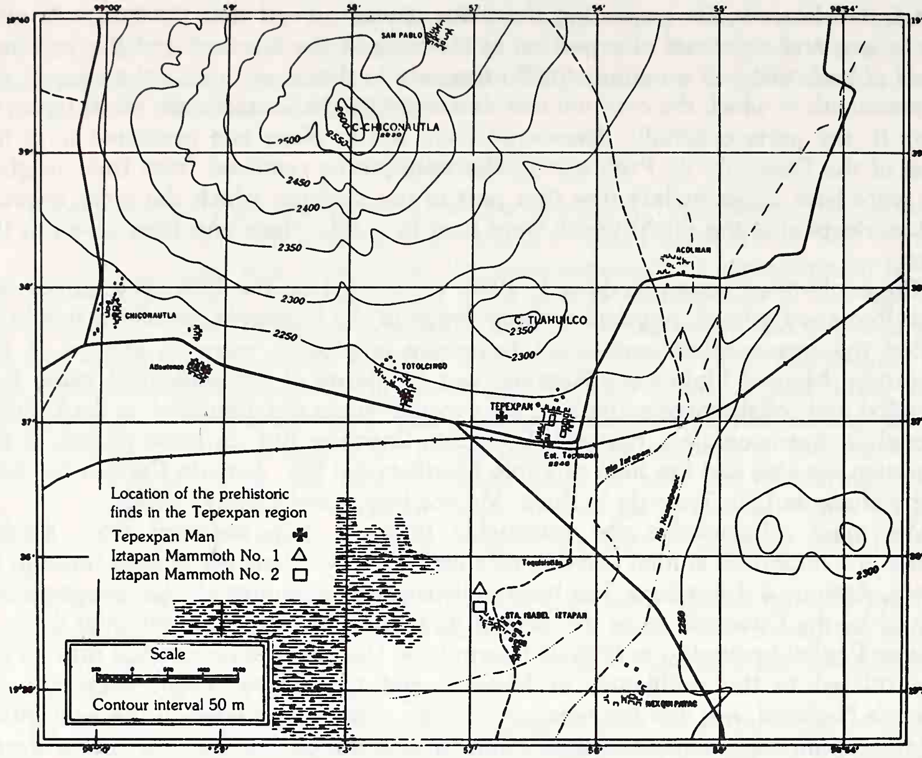

Figure 1. Map of Tepexpan area in northwestern portion of Valley of Mexico. The Pan-American Highway runs north from the village of Chiconautla (at the left); the road to San Juan Teotihuacán runs eastward through Tepexpan and Acolman, then north to the pyramids of Teotihuacan (off map to upper right). The marginal marshes of present Lake Texoco appear at the lower left. Mexico City lies about 20 miles southwest of Tepexpan.

"bottle-neck" which still connected the lakes of Texcoco and Xaltocan in colonial times.

The courses of the present streams in this zone empty into the lake toward the west and southwest of Santa Isabel Iztapan and are not of permanent character. Most of them are branches of the delta of the Río San Juan, and they are known by the names of Río Iztapan, Río Nexquipayac, and Río Nuevo from north to south, respectively. None of these channels, however, pass sufficiently near the site of the mammoths at Iztapan to alter, or to have altered in any form, the stratigraphy resulting from the slow deposition of mud in the lacustrine depths. This circumstance, as will be seen later, is important in connection with the position of the mammoth remains.

The remains of both Iztapan mammoths were located considerably farther into the lake basin than the site of Tepexpan Man. Toward the end of the Pleistocene, in the times when the pachyderms were hunted, the lake margins must have been more than 3 km beyond the present town of Santa Isabel Iztapan, toward the north and northeast, on the skirts of the Chiconautla and Tlahuilco hills. In spite of this, the difference in elevation between these shores and the zone of Santa Isabel Iztapan is so slight that the depth of the waters of the lake at the location of both mammoths must not have been greater than 60 to 70 cm. Near the present town of Tequisistlán and Santa Isabel Iztapan there is a slight elevation of the terrain above the general level of

the sloping plain. It is possible, therefore, that during the Pleistocene era there might have existed here a kind of peninsula or tongue of land, more or less firm, from which the hunters could operate with greater ease.

The lake which existed at the time of these hunts must have been that which de Terra (1947:20) referred to as El Risco Lake III (elevation 2240 m), and which he considered the one associated with Tepexpan Man as well (de Terra 1949, Table I). This shore of El Risco Lake III has been totally destroyed by erosion in the region of Tepexpan, but its remnants are observed in localities nearby such as at El Risco. On the slopes of the Chiconautla and Tlahuilco hills there remain today only vestiges of the higher, and consequently more ancient shores of the Upper Pleistocene era: El Risco Lake I (2263 m) and El Risco Lake II (2257 m), both too elevated to have been contemporaneous with that of Tepexpan Man and the elephants of Iztapan.

Techniques of Excavation

The first fossils were found by José Cortés when deepening a drainage ditch which serves as a boundary for his farm land. This operation revealed, without harming in the least degree, part of the base of the skull and the inferior portion of the alveoli, as well as a small sector of the proximal third of both tusks. From the curve of these tusks, it was known from the beginning that the skull was inverted.

The exploration followed a minutely cautious technique, adapted to the special conditions of the terrain and taking advantage of experience acquired in excavating the first mammoth of Iztapan and other similar works of the Dirección. The procedure is fundamentally the same as that followed with a delicate human burial, giving special attention to control over the geological strata overlying the bones, and to the search for associated implements which, because of their small size, require very laborious dissection of the deposit surrounding every one of the bones.

The first phase of this work was to discover the maximum area of dispersion of the bones by means of little test trenches. It was soon seen that the greater part of the remains lay to the east* of the skull, so that it was necessary to widen considerably this side of the pit and to cut down a tree in this sector. Without yet deepening the excavation over the area which covered the bones, the four walls were made even wider for the double purpose of providing comfortable free space for working around the skeletal remains, and of locating possible additional bones which could be isolated from the principal group (as at Iztapan No. 1). In its final dimensions the pit was 7.05 m east to west by 5.30 m north to south.

The next step was to deepen the free area around the skeletal remains up to the four walls, which at all times were kept perfectly smooth and vertical, with 90 degree corners. The pit around the skeleton was deepened to a level much below the bones, so as to leave the whole mass on a bank of clay, a circumstance which permitted greater comfort during the exploration and which made possible the excavation of many little tunnels and bridges around the bones, leaving them in place on pedestals of clay (Fig. 2). These operations were executed with gardening tools, spatulas, needles, and brushes. Shovels and picks were used exclusively for cleaning the pit around the skeleton. The problem of seeping water, which began to appear in abundance around the skeleton when the excavation reached approximately 1.60 m in depth, was solved by means of a pump.

The Mammoth Remains

The skeletal remains were delimited within an area 3.60 m north to south by

*This was mistakenly referred to as "west" in the original report, page 12. —*A.D.K.*

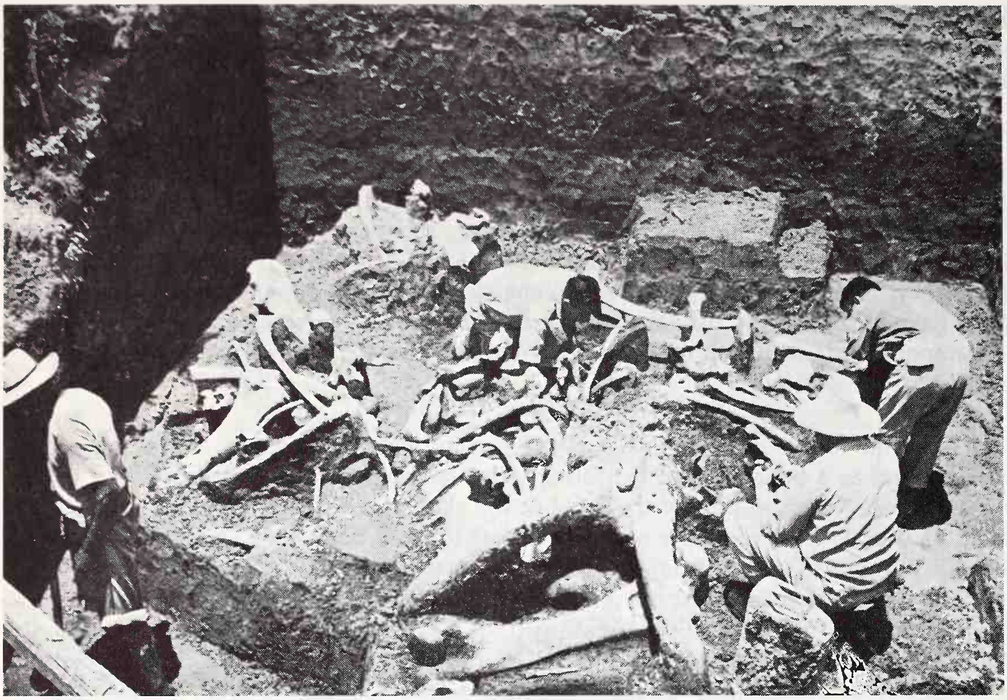

Figure 2. Excavation of mammoth skeleton in progress.

4.75 m east to west. The highest bones (inverted tusks) were found at 1.40 m below the surface. This level is 20 cm higher than that of the uppermost bone of the first mammoth at Iztapan (Aveleyra and Maldonado-Koerdell 1952: 14). The remains of the second mammoth, however, were totally included within the lowest geological stratum present, which in this vicinity is a greenish muck (*limo verde*) belonging to the Becerra formation, the terminal phase of the Upper Pleistocene. The same lacustrine facies of the Becerra formation completely surrounded the skeleton of the first mammoth at Iztapan (Aveleyra and Maldonado-Koerdell 1952: 12-13), as well as the remains of Tepexpan Man when discovered by de Terra and his associates in 1947.

Although the geological deposits at the two Iztapan sites are the same, those at MammothTwo are less clearly seen than the corresponding ones at Mammoth One. At Mammoth One there is a more gradual transition in coloration and texture of the materials from one stratum to another, which might be due to the fact that this locality is located farther into the ancient lake than the first one, and consequently was subject to more stable conditions of moisture and deposition. Both mammoths, however, lay in exactly the same geological position, completely enclosed within the green muck of the Upper Becerra formation, which lay immediately below a *marshy equivalent* of the Totolzingo formation of the early Postglacial period. In the photograph (Fig. 5b), this deposit can be clearly seen as a black band overlying the lighter-colored Becerra formation.

As for the taxonomic classification of the mammoth, the very bad preservation of the upper molars (the only ones recovered), the crowns of which are completely obliterated, does not permit identification of the species. The great robustness and curvature of the tusks suggests, however, that they may belong to an imperial mammoth, *Mammuthus* (*Archidiskodon*) *imperator* Leidy, the largest of the American

proboscideans. This suggestion is reinforced on considering that all mammoths discovered up to date in the plain of Tepexpan and nearby places have been identified as imperial mammoths. In an interesting study Maldonado-Koerdell (1955) explains the very probable coexistence of two species of mammoth in the Valley of Mexico during the Upper Pleistocene, describing two molars of *Mammuthus* (*Parelephas*) *columbi* Falconer in the important prehistoric site of Tequixquiac. According to Maldonado-Koerdell the two species had different habitats within the Valley of Mexico: the Columbian mammoth lived on the surrounding elevations covered with forest, and the the pastures of the lower plains near the lake.

As to the age of the second mammoth of Santa Isabel Iztapan, the large size of the bones and tusks, the pronounced smoothness of the crowns of the molars, and the complete ossification of the epiphyses of the long bones, indicate that it was an adult animal that had reached the period of maximum growth. The first mammoth of Iztapan was a young animal (Aveleyra and Maldonado-Koerdell 1952: 15-16).

The mineralization of the remains is appreciable although not extreme. The bones show a typical dark coloration which characterizes all the fossil remains which are found in this region, and which is due to the impregnation of mineral salts peculiar to the terrain.

The skeleton was incomplete, lacking some large, heavy parts: the mandible (of which there was found only a small fragment corresponding to the symphysis); both humeri; the right ulna; both radii; the left femur and the right scapula. An inventory of the ribs and vertebrae reveals, on the other hand, that the thoracic box and vertebral column were almost complete. As was said above, the skull was also recovered, with its two molars and tusks. Besides this, the pelvic girdle and a great number of additional small bones were present (Figs. 3, 4).

All the bones were found totally displaced and out of anatomical relation, with the remarkable exception of the right hand leg (see below). The scattering of these bones,

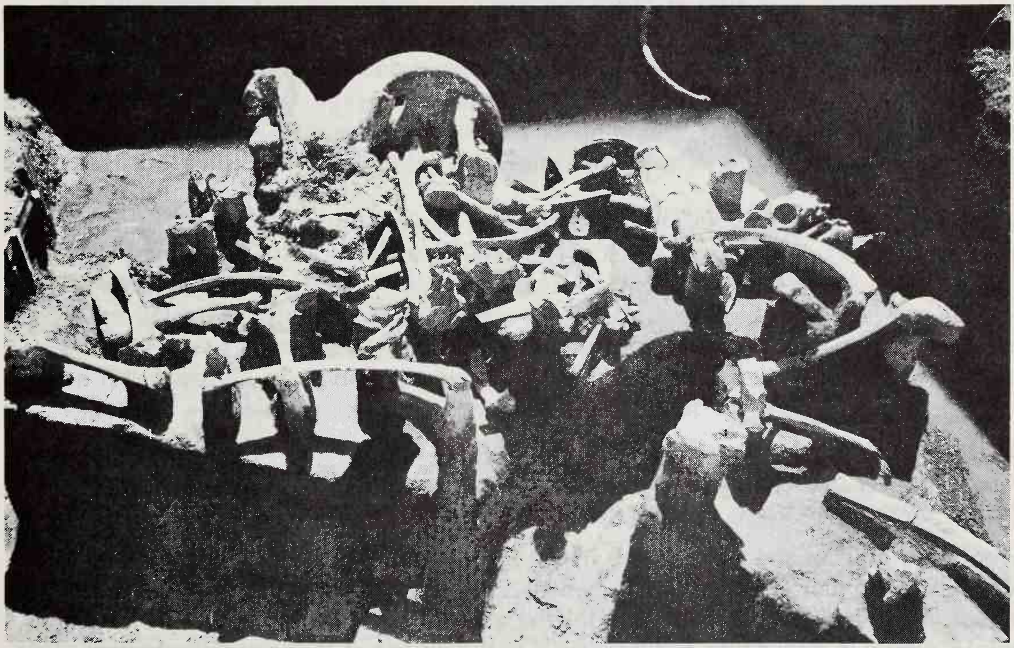

Figure 3. Excavation of mammoth skeleton completed. Hose for pumping seep water appears at upper right.

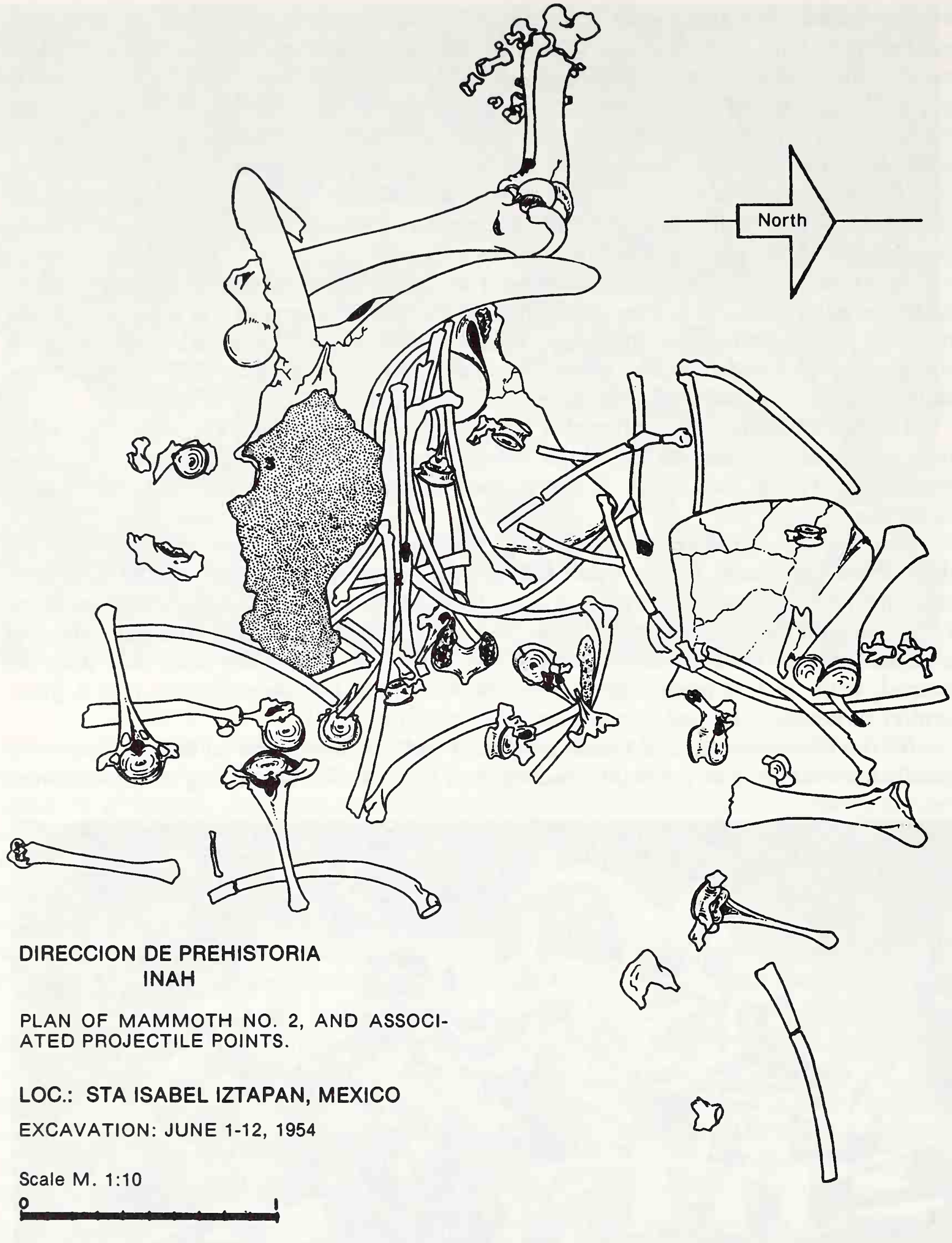

Figure 4. Ground plan of second mammoth skeleton at Santa Isabel Iztapan. Shaded area represents the broken-off under portions of the skull. The positions of 3 stone artifacts are shown, numbered to correspond to the text.

even more than in the case of the first Iztapan mammoth, must unquestionably be referred to human activity. Displacement by natural agents appears impossible to accept. The stratified deposits around the skeleton reveal only very fine sediment, uninterrupted in deposition and horizontal to the slimes of the lacustrine bottom. This type of deposit can only be the result of a slow sedimentation through several

millennia without any violent current which could have moved the bones about, even the small ones. On the other hand, disturbances due to predatory animals feeding on the carcass of the mammoth must have been at a minimum as the only carnivorous mammal of any size existing in the Valley of Mexico at that time was the dire wolf (*Aenocyon*) and related forms, the powerful sabre-tooth having become extinct earlier. Even admitting the intervention of canidae and other predatory animals, they could have moved only with great difficulty in water more than a half meter deep.

In summary, it appears definite that the position of the skeletal parts when found was practically the same as that in which they were left by the hunters after cutting up their prey. This leads to a very important conclusion: *Given the geology of a site such as that of the mammoths of Santa Isabel Iztapan, the position of skeletal parts alone is evidence of human intervention in its dismemberment; the hydraulic factors rule out other explanations.*

The story of discoveries related to the geological antiquity of man in America has demonstrated that there exist four* fundamental types of association between extinct fauna and implements of human origin:

(1) Alluvial deposits in which artifacts and fossils have been transported a certain distance from their original place by a force of water, completely destroying the anatomical relation of the skeletal remains, and where isolated bones of different animals may be mixed in. These associations are usually discovered in the eroded exposures of stream, lake, or aeolian deposits. A typical example is the famous fossil site of Tequixquiac, located just to the north of the Valley of Mexico.

(2) Ancient watering places and other strategic sites at which animals gathered periodically, and where prehistoric man achieved collective hunting (the "butchering grounds" or "kill sites" of North American archaeologists). In these cases there are found masses of fossil bones, many of them broken, in complete disorder and pertaining to dozens of killed mammals. The represented species are usually diverse, and the associated artifacts relatively abundant. Examples of this type of association are some of the more famous sites of primitive man in America such as Lindenmeier, Colorado; Plainview, Texas; Folsom, New Mexico.

(3) Caves to which hunters brought parts of slain animals to be further butchered and consumed. Complete disorder and fragmentary representation of different species are also characteristic. Examples are Sandia and Burnet caves, New Mexico.

(4) Sites in which a single animal was killed and in which, thanks to special geological conditions, the absence of later disturbance has permitted preservation of the remains just as they were abandoned by the hunters. The advantages provided by this last type of association over the three preceding ones are obvious, since they can illustrate the hunting customs of prehistoric man in such aspects as the selection of vulnerable points at which to wound the animal, the parts especially selected for food, the techniques of butchering, and so on.

The discoveries at Santa Isabel Iztapan are magnificent examples of this last type of association. The system of exploration used permitted us to keep a detailed record of the exact position of each bone in relation to the others, deriving observations of great interest.

The cranium of the second mammoth, disarticulated and inverted, has special importance. Because of its great weight, this position cannot be attributed to any

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*The original report lists three types of association: (1), (2), and (4). I have added (3) with the consent of the author. —*A.D.K.*

other factor besides that of human activity. The reason for turning the skull upside down could well have been the extraction of the brain which must have been a favorite delicacy for primitive man. The apparently intentional destruction of the skull base around the occipital foramen seems to confirm this assumption. The skull of one of the mammoths excavated by Arellano (1946b, Figs. 1, 4) in the plain of Tepexpan was found in an analogous position.

The vertebral column and the thoracic box of the mammoth were the parts most minutely dismembered. All the ribs and vertebrae were found dispersed without the least anatomical relationship (Fig. 4). Surely the "loins" and "ribs" of the mammoth were among the parts preferred for food. The limbs were also disarticulated, but in this case many parts were taken away and more widely dispersed. This is especially true of the forelegs, of which only the left ulna was found. The corresponding hind limb was represented by the tibia only. The hind leg, on the other hand, constitutes a remarkable exception from the rest of the skeleton, as it not only was found complete, but also in complete articulation. The proximal end of this limb (head of the femur) rested very near the cotyloid cavity of the corresponding ilium. In the photograph (Fig. 5*a*), the way in which this articulated leg lay underneath the inverted skull can be appreciated. Its articulation was probably due to the fact that the leg could not be reached during the task of butchering. The foot of this leg was sunk deeply into the mud, immobilizing the animal; this foot was the lowermost point of the skeleton.

The position of the pelvic girdle and the articulated hind leg provides, besides, the only data suggestive of the probable direction which the animal followed im-

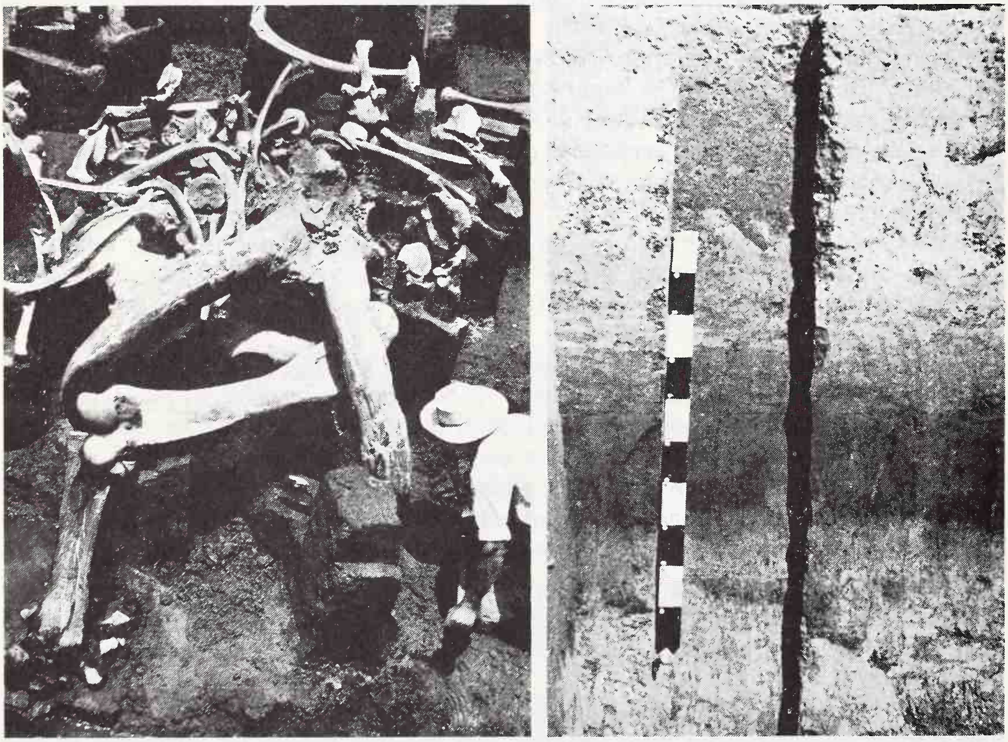

Figure 5. a. View of inverted tusks over articulated right hind leg; the tibia and foot bones at lower left were sunk deeply into the Becerra muck, probably indicating how the mammoth was mired and killed. b. Stratigraphic profile of deposits overlying the mammoth remains (see Fig. 9 for explanation).

mediately before being trapped in the marsh, toward the east, perhaps trying to reach firm land at the east edge of the lake.

Proof of human intervention in the cutting up of the second mammoth at Iztapan, besides the position of the bones, is provided by the marks and scratches found over many of the bones. Some of these scratches could be attributed to the gnawing of predatory animals, after the carcass was abandoned by man. Nevertheless, there are other marks and cuts which must have been made with scrapers and knives to dismember the carcass. In several European Pleistocene localities, by means of statistical studies based on hundreds of bones found in open sites, shelters, or caves with the deposits of primitive man, it has been possible to prove the *constant* presence of certain kinds of marks and cuts at certain key points where the main muscles and ligaments were attached to the bones, and which had to be cut to achieve an effective dismemberment of the animal. A remarkable study of this kind is that accomplished at the Mousterian site of La Quina (Charente), France (Martin 1910). At some localities in the United States similar investigations have been attempted recently (White 1952, 1953, 1954).

In the case of the second mammoth at Iztapan these marks were found on a large number of the epiphyses or articular facets of the long bones, especially on the head of the only femur, around the fossa of insertion of the so-called "round ligament." These marks have been described by Martin quite often in cases of coxofemoral disarticulation (Martin 1910, Pl. 50, 9, 10, 11). There are very frequently also, in cases of intentional skull disarticulation, cuts and transverse grooves over the ridges of the lateral processes of the first cervical vertebra (atlas) of mammals (Martin 1910, Pl. 47, 3, 4, 5). Such marks are clearly observed on the Iztapan mammoth atlas.

Another remarkable object found in the exploration is the rib fragment illustrated in Figure 6. Martin illustrated several cases of incisions on ribs, made, according to him, during the process of defleshing (Martin 1910, Pls. 40-3). However, this fragment of the Iztapan mammoth shows such a quantity of scratches and deep cuts that it is inadmissible that these were simply the result of defleshing a bone. In Figure 6 the front view of this rib shows a series of cuts regular in size and depth, arranged symmetrically on both sides of the ridge. These marks must have an explanation not yet discovered.

Associated Artifacts

During the course of the excavation three implements of chipped stone (Fig. 7) were found in irrefutable association with the mammoth remains. Two of them (Nos. 1 and 3) were discovered and photographed *in situ*. The third artifact (No. 2) was found underneath an aggregate of ribs and vertebrae toward the center of the skeletal remains, while this zone was being explored by means of small tunnels excavated under the bones; therefore, it was not possible to observe its exact location. The position of these implements with respect to the skeleton is recorded in Figure 4.

Artifact 1. This is a lanceolate atlatl (dart) point without shoulders, base slightly concave, and very symmetrically shaped. The edges converge gradually toward the tip and the base from the middle, which is the widest part. Its maximum dimensions are: length 80.2 mm , width 27.4 mm , thickness 8.5 mm. This artifact is skillfully fashioned on both faces from a flake which retains some of the original fracture planes in the middle part of the lower third. It shows pressure flaking, very fine and applied over all the basal edges, as on most of the early types of projectile points of the Pleistocene and early post-Pleistocene of North America. The tip appears to be somewhat weathered. The material is of igneous origin, probably dacite, of fine texture and dark

Figure 6. Section of mammoth rib bearing numerous deep cuts made with stone knife.

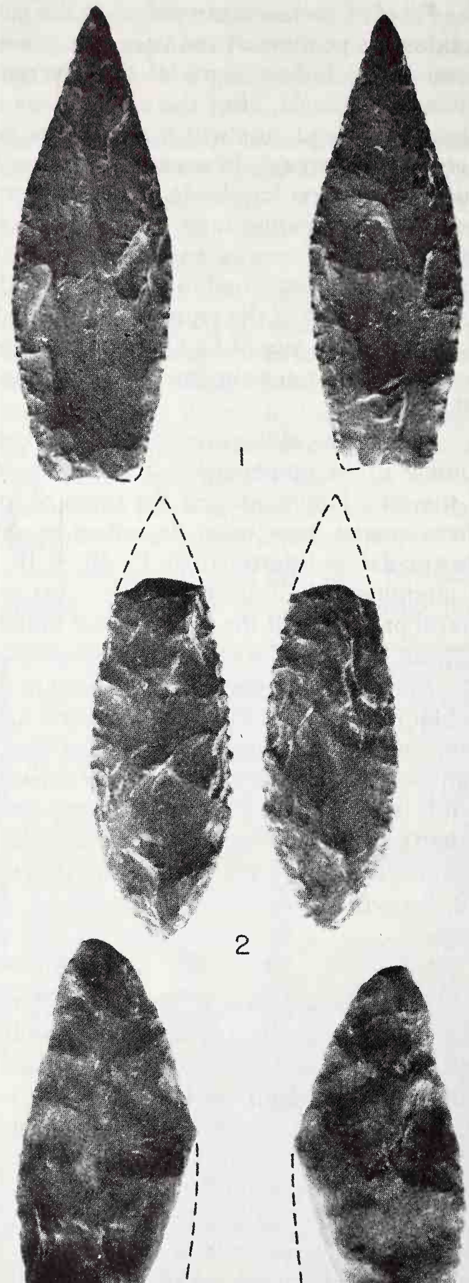

Figure 7. Three stone artifacts found in association with second mammoth. Positions are shown in Fig. 4. Dimensions and descriptions are given in the text.

red color; it is foreign to the Valley of Mexico but abundant in more northern regions, especially the states of Guanajuato and San Luis Potosi. This specimen was found near an isolated rib at the northeastern extreme of the skeletal remains (Fig. 8).

From the point of view of typology this point is of great importance since it is identified with the recently recognized Angostura type found widely in the Great Plains of the United States. The presence of such points in certain fossil localities of considerable antiquity was pointed out several years ago, but without assigning them a distinctive name (Krieger 1947, Pl. 1A, C). Even earlier, an example was discovered in Texas in apparent association with mammoth remains (Sellards 1940, Pl. 1, 4). In eastern Wyoming very similar points appeared with bones of fossil bison (Anonymous 1943; Wormington 1949: 65). However, the Angostura type was not recognized formally until the excavations of Hughes in the Long site above Angostura Dam in South Dakota (Hughes 1949), where they were found in deposits belonging to the early Postglacial period and initially described as "Long points." This deposit was later dated at 7073 ± 300 years ago by the radiocarbon method (Libby 1955: 126). Similar points have been described from the Agate Basin in Wyoming (Roberts 1951), and from Bexar and Blanco counties in south-central Texas (Orchard and Campbell 1954).

All archaeological data now available tend to place the Angostura type in a *second lithic level* in the Great Plains, which also includes the Plainview, Scottsbluff, Eden, and probably other types (Krieger 1950: 120 and Fig. 8; Suhm, Krieger, and Jelks 1954: 402). Although this period corresponds to the early Postglacial it is very probable that its beginnings were contemporary with the last Pleistocene glaciers. It succeeds the *first lithic level*, called by Sellards (1952: 17) the horizon of the "Llano Man" of which the Clovis fluted projectile point type is characteristic and which is well within the Pleistocene (Krieger 1950, Fig. 8).

The association of an Angostura point with the second Iztapan mammoth is a firm indication of the presence in Mexico of this second lithic horizon of the paleo-Indian cultures in North America. The Plainview point found in Tamaulipas (Arguedas and

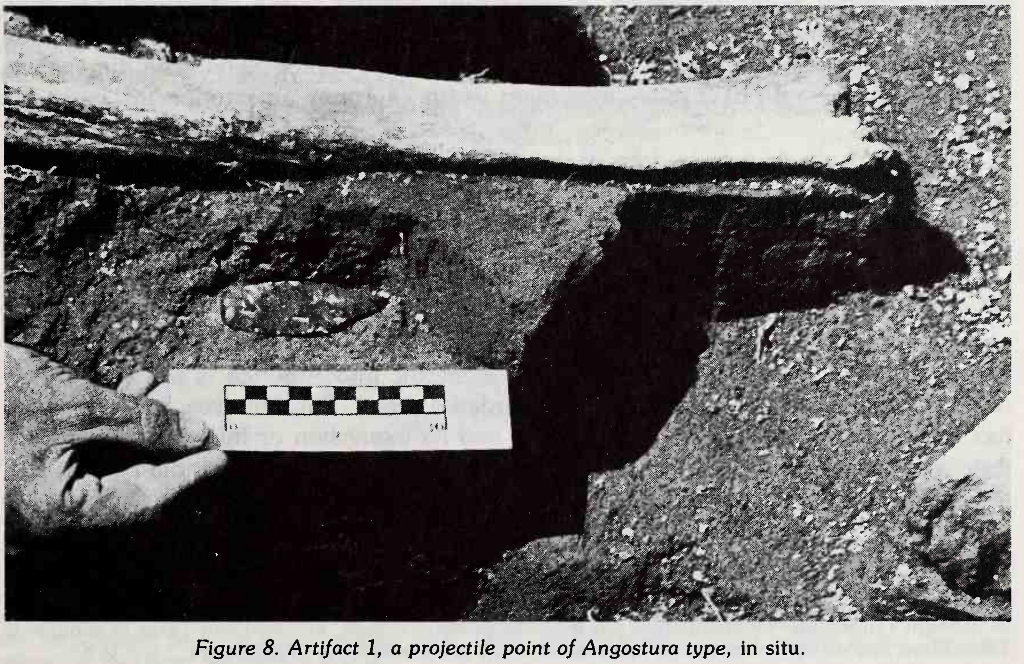

Figure 8. Artifact 1, a projectile point of Angostura type, in situ.

Aveleyra 1953), and the projectile point related to the Scottsbluff type found with the first mammoth at Iztapan (Aveleyra and Maldonado-Koerdell 1952, Figs. 8, 9; 1953, Fig. 105, 1), seem to confirm this.

The association of Scottsbluff and Angostura points with the Iztapan mammoths points to a serious problem. When found in the Great Plains with extinct mammals they are invariably associated with fossil bison, a species which may have survived in that region several thousand years longer than the mammoth. The only exception to this rule is at the Buckner ranch, near the Texas coastal plain, where a peculiar mixture of different types of points was apparently associated with remains of several extinct species, including mammoth (Sellards 1940, Pl. 1, 4, 5, 7, 8). These may now be identified as an Angostura, a Scottsbluff, a Folsom, and the basal fragment of a Clovis point (Suhm, Krieger, and Jelks 1954: 120-1). Aside from this unique case the projectile points discovered with mammoths in the United States have usually been the fluted Clovis, corresponding to the first lithic level already mentioned (Figgins 1931, 1933; Cotter 1937; Bryan and Ray 1938; Sellards 1938; Haury 1953).

Such a situation in central Mexico can be explained in two ways: either the Scottsbluff and Angostura points are more ancient and perhaps originated in Mexico, or the mammoth survived in central Mexico after its extinction in most of the United States. Probably the second alternative is the true one.

Artifact 2. The second artifact was found under a complex of ribs and vertebrae toward the center of the remains. It is a projectile point, leaf shaped, made of brown flint of excellent quality. This material is also foreign to the Valley of Mexico. The specimen lacks the distal extremity, which could not be found in the excavation. Originally, the projectile must have been of a laurel-leaf contour, pointed at both ends. The possibility that the missing end was the original *base* of the projectile must be discarded in view of the general contour of the body and the considerable thickness of the fractured cross section, which does not show a gradual thinning to facilitate hafting. The chipping is bifacial, with scars of irregular flakes over both sides and fine pressure flaking along the edges. A remarkable feature is the intentional serration observed on both edges except on the proximal third; this detail confirms that the true base of the projectile is the lower part as shown in the photographs. The dimensions are: maximum length 61.3 mm , maximum width 24.4 mm , maximum thickness 8.1 mm.

There are no reports to date of the discovery of such double-pointed laurel-leaf projectiles associated with extinct fauna in any site in America.* The form is elementary enough and is found in abundance in diverse cultures of the European continent, in very different chronological horizons. The similarity of this point to the famous "laurel leaves" of the Middle Solutrean of Western Europe is remarkable. This relationship is valid strictly from the typological point of view, without implying a *direct* contact between the paleo-Indian culture and the Upper Pleistocene of Europe. The possibility of extension of the Old World Paleolithic into America is not entirely remote and, at any rate, it must not be discarded *a priori*. The Solutrean, for instance, has very important foci in eastern Europe and its expansion or influence toward the Asiatic East is possible. The Solutrean shape seems to show in the Sandia type points, the most anciently known so far in America, and is indication enough that infiltrations

*This statement is true for association with extinct fauna. However, in Suhm, Krieger, and Jelks 1954, p. 440 and Pl. 99, we described and illustrated the bipointed *Lerma* type first recognized by R. S. MacNeish in southern Tamaulipas. Its distribution was given as western, coastal, and southern Texas in addition to Tamaulipas, and its age estimated as "several thousand years before the Christian era." —*A.D.K.*

from the Upper Paleolithic of Eurasia into the New World possibly occurred.* Needless to say, this digression does not pretend to prove a Solutrean affiliation for the second point found with the Iztapan mammoth.

Artifact 3. The third artifact was found *in situ* approximately underneath the right supraorbital ridge of the inverted skull of the mammoth. In this case the artifact is a biface knife, fashioned from impure flint (chert) of very light color with whitish bands. The shaping was done by percussion completely over both faces, with scars of wide irregular flakes, conditioned perhaps by the poor quality of the material. There is secondary retouching by pressure on some small sectors of the edges. The broken edge coincides with an increase in thickness of the artifact near the middle, and as the breakage is very ancient, it might have happened during the original shaping process. It is probable that the knife originally was of laurel-leaf form with both ends pointed. In its present state the artifact measures 67.2 mm in length, 34.9 mm in maximum width, and 9.3 mm in thickness.

It is evident that this object could never have been destined to be a projectile point, considering its general size, thickness, and irregularity of flaking. Typologically, it is a simple knife which, even after breakage, could still have been used effectively for cutting up the mammoth. The place in which it was found, underneath the skull and near the atlas, could indicate that it was one of the implements used in the complicated task of disarticulating the cranium of the animal. The presence of scrapers, knives, and other cutting implements was also abundantly proved in the exploration of Iztapan Mammoth 1.

Summary

The little "industry" of Santa Isabel Iztapan, found with the two mammoths in identical stratigraphic position, scarcely 400 m apart, provides no less than ten artifacts. Of these, three are projectile points, each of a distinctly different type (Scottsbluff, Angostura, and "laurel-leaf"). This mixture of types in association with isolated remains of extinct animals is almost unique in North America. The great majority of such finds have demonstrated strict uniformity in associated points, as in the recent discovery at Naco, Arizona, of a mammoth with eight Clovis points (Haury 1953). The only exception known to me besides that of Iztapan is the Buckner site in Texas already mentioned.

The typology of the more ancient lithic industries of Central Mexico is still extremely confused and full of all those unknowns typical of the regions in which prehistoric investigation is barely being started.

—1955

*The idea that *Sandia* points can be derived from the Upper Paleolithic of the Old World has already been noted by Bosch Gimpera (1948: 6-8), who relates them with the Gravettian "notched points" which also persisted in the Swiderian stage in Poland. The *Gravettian* and *Swiderian* points, however, are unifacial and very distinct from the bifacial *Sandia* point, which are much more nearly parallel to the "notched points" of the Upper Solutrean.—*A.D.K.*

APPENDIX ON STRATIGRAPHY

Manuel Maldonado-Koerdell

The site of the second Iztapan mammoth is located on the plain left by Lake Texcoco, in its northeast portion, when it retreated westward. The geographical position of this site is more western than the first Iztapan mammoth and, consequently, when the ancient lake covered it this site was deeper under the water. This is an important detail, which contributes toward explaining some little differences in stratigraphy and supports certain paleo-ecological deductions. At the present time, the terrain is used for milpa agriculture, but it is interesting that around the second mammoth there is an abundance of *huejotes* trees (*Salix bonplandiana*) in rows, a sure indication of native chinampa gardens in not very ancient times.

The stratigraphic column at the excavation of the second mammoth is shown in Figure 9. Comparing this column with that at the site of the first mammoth, one notices a greater thickness of the Postglacial sedimentary materials, which measure 1.37 m as against 0.95 m at the site of Iztapan Mammoth 1. Also, the different strata are better defined, showing with greater precision the two edaphic developments which have taken place during the last 10,000 or 12,000 years. In fact, Horizons A, B, and C correspond to modern soil, of dry to subhumid climate and pasture vegetation (when agriculture is not practiced). Horizon D corresponds to a marshy bottom in which a transition soil originated, in a rainy (or more humid) climate with prairie vegetation, conditioned in its development by the oscillations of the retreating lake; however, the band of peat indicates a period of certain permanency in the waters.

Possibly, Horizon C corresponds to the lower part of the ''zona Iluvial'' of Bryan (1948), with accumulation of a certain amount of calcium carbonate (represented by the fine basal deposit of caliche), originating in a hot climate. In this case Horizon D would correspond to the ''zona vadosa'' of Bryan, always saturated with water which maintained continuous vertical oscillations, due to the presence of a mantle of surface water under much more humid climatic conditions. Such conditions would have created this transitional soil, essentially immature, or even perpetually ''young,'' which Bryan describes as typical in the lower Recent of marshes which occasionally dried.

At their contact, there is no well-marked distinction (as in the case of Mammoth 1) between Horizon D and the Becerra formation (Horizon E). Farther down in the Becerra lithological characteristics separate these horizons more clearly, since Pleistocene material acquires a certain lumpy texture with concretions which contrasts with the granular texture and brown color of the younger Horizon D. Besides, the little root channels found higher do not reach the Becerra formation, although at both levels there are fragments of gastropod shells and lacustrine bivalves. The lower part of the Becerra formation (Horizon F) has a strong proportion of bentonitic material which gave rise in places to lenticular inclusions of black color. This deposit contained the mammoth remains and corresponds to the level of ''green slimes,'' as in the case of the first mammoth at Santa Isabel Iztapan.

This stratigraphic column, as well as others studied in the Valley of Mexico, reveals fluctuations in the course of the last 15,000 years. It may be estmiated that, from bottom to top, Horizons E to A indicate, with some fluctuations, a general tendency toward greater dryness and higher temperature from the beginning of the Recent up to the present, accompanied by retreat of the lake. Horizon D, alternatively under water or dried, reflects these variations in its composition, and toward the end comes to be more altered because of being in the zone of maximum saturation, for through it all the dissolved salts from the upper zones pass, with much oxygen and carbon di-

Mammoth No. 2 Site Stratigraphy

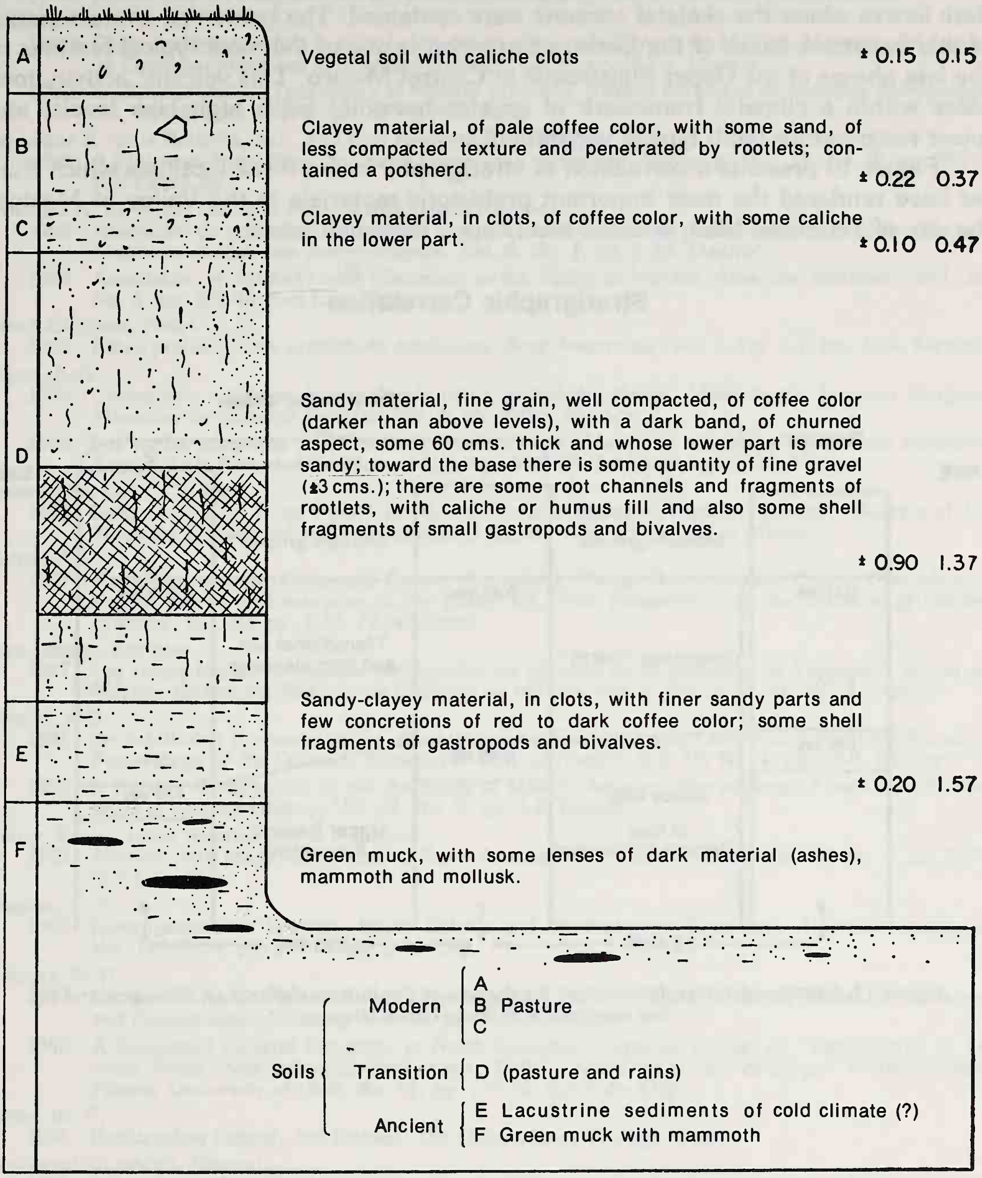

Figure 9. Stratigraphic column at the site of the second mammoth of Santa Isabel Iztapan. The mammoth was associated with Stratum F, the green muck (limo verde).

oxide. It is possible that the fine caliche deposit of Horizon C corresponds to the Post-glacial arid climate, which culminated about 7000 years ago, ending the edaphic process with Horizons B and A.

Horizons E and F correspond to the lacustrine facies of the Becerra formation and were deposited by a complex mechanism of fluvial dragging and aeolian transport, but in a continuous manner and under water of rich organic content. At certain periods of

the Upper Pleistocene there was a mixing of abundant ashy materials from the nearby volcanoes (in this case possibly the Tlahuilco, less than 2 km north, which maintained its activity up to recent times), giving rise to this fine bentonitic deposit with scattered dark lenses where the skeletal remains were contained. The bentonitic characteristics of this lacustrine facies of the Becerra formation is one of the most typical features of the late phases of the Upper Pleistocene in Central Mexico. This volcanic activity took place within a climatic framework of greater humidity (with high lake levels) and lower temperature (with typical vegetation).

Figure 10 presents a correlation of stratigraphy in the three localities which thus far have rendered the most important prehistoric materials in the Valley of Mexico: the site of Tepexpan Man, and the two Iztapan mammoth sites.

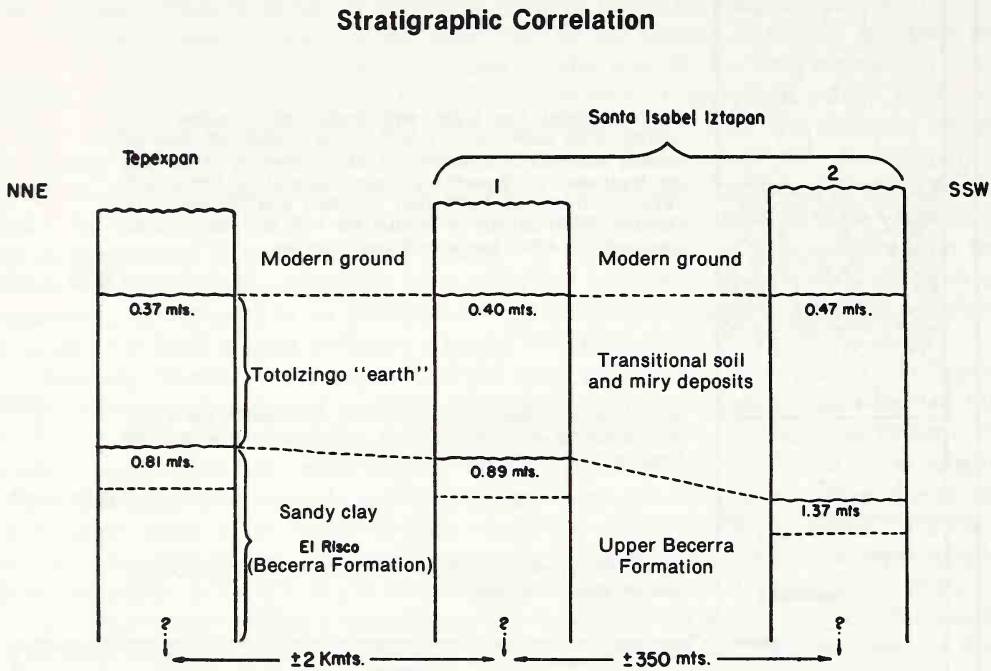

Figure 10. Stratigraphic correlation chart for the site of the human skeleton at Tepexpan and the two mammoths at Santa Isabel Iztapan.

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6

Ancient Mesoamerican Civilization

by Richard S. MacNeish

A problem that has long interested the layman, the scientist, and the philosopher has to do with how and why civilizations arose. Any hypothesis or generalization about this social phenomenon must be based on broad comparative historical data. Specifically, one must compare long archeological sequences, from savagery to civilization, which have been uncovered in relatively independent areas. The ancient high cultures of Mexico and Central America (termed Mesoamerica) have always represented an interesting facet of this problem, for here were prehistoric civilizations which apparently arose independently of any of those in the Old World.

It is generally accepted that the development of agriculture is basic to the rise of village and urban life. And so, in our work in Mesoamerica, it was assumed that if we could but find the origins of agriculture—and in the New World this meant maize or corn—then we would be well on the way to finding out where and how civilization evolved in America.

After a number of years of investigation, it became apparent that the desert valley of Tehuacán (about 150 miles south of Mexico City) was the region in which evidence could most likely be uncovered about the beginnings of the domestication of corn[1]. Precisely why we decided on this area is explained in an article by Mangelsdorf and others in this issue (*Science* 143; p. 538 [1964]), so I confine my discussion to the archeological researches recently undertaken in this southern Puebla valley.

In attacking such an all-inclusive problem, the project was most fortunate in having the cooperation of a number of scientists from a wide variety of fields. Obviously, I am extremely grateful to these various specialists, but I must confess that I say this with a sigh of relief, for at the beginning of the first field season we were far

from convinced that the much-vaunted interdisciplinary approach was practicable. We know now that it can and does work, and thanks to our experts' endeavors we have gathered and interrelated specialized studies in botany, corn, beans, squash, human feces, pollen, zoology, geology, geography, physical anthropology, prehistoric textiles, ethnohistory, and ethnography[2]. These investigations, of course, were in addition to the usual archeological researches carried out so ably by my field staff[3].

Before discussing what our diverse group accomplished in the Tehuacán Valley, let me briefly describe the valley itself. It is located in the southern part of the state of Puebla, and in the northernmost section of the state of Oaxaca, in the central highlands of Mexico (see Fig. 1). Efforts were concentrated in a relatively small area, about 70 miles long and 20 miles wide. Although the valley is considerably longer than it is wide, it has a basin-like apperance, for it is ringed by high mountains. The Sierra Madre Oriental is to the south and east, while to the north and west are the Mixteca Hills. Both rise considerably above the Tehuacán Valley floor, which is 1500 meters above sea level. Because of these precipitous mountains the valley is in a rain shadow and extremely dry. Most parts of the valley floor receive less than 600 millimeters of rainfall a year, and some parts receive less than 500 millimeters. Moreover, most of this rain falls during a 2-month period. Needless to say, the resultant vegetation is xerophytic. Thus, the Tehuacán Valley has all the characteristics of a desert.

Intensive archeological investigation in this region has now been under way for 3 consecutive years; in addition, I spent a brief 10 weeks in the area in 1960. Archeological reconnaissance has resulted in the discovery of 392 new sites or prehistoric habitations. These range from small temporary camps to large ruins of cities. At about 30 of these sites test trenches were dug. These were superficial, but even so, one sounding yielded stratified remains with five occupational floors, one above the other. Twelve test trenches in other sites revealed deep stratified remains. Excavations in these particular sites were expanded into major digs and became the basis for establishing a long prehistoric sequence of culture.

In these 12 sites of major excavation (selected from the original 392 sample sites), 140 stratified floors and occupational zones were unearthed. Five of these were open sites or middens, while seven were caves or rock shelters, or both.

Because of the extreme dryness of the area, in over 55 of the floors in the five caves everything had been preserved: foodstuffs, feces, and other normally perishable human remains and artifacts. This type of refuse not only allows one to make an unusually complete reconstruction of the way of life of the ancient inhabitants, but gives considerable information about subsistence, food habits, diet, climatic changes, and, in many cases, even indicates which months of the year the floors were occupied.

Although our studies are a long way from completion (it has taken much time to even count and catalog the 750,000 specimens so far uncovered), preliminary results

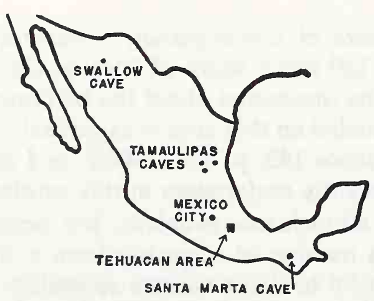

Figure 1. Tehuacán area of Mexico.

have been most encouraging. Some of these I summarize briefly in the following paragraphs.

Ajuereado Phase

The earliest assemblage of artifacts is called the Ajuereado phase[4]. In the caves, we uncovered evidence of seven different occupations, while surface collections have yielded four more sites of this cultural complex. As yet we have only three dates, obtained by the carbon-14 technique, on the final stages of this phase, but another five are being processed. The phase seems to have ended by at least 7200 B.C., and it may have come into being three or four millennia earlier. Examination of these floors indicates that in this period the inhabitants were grouped together into small, nomadic families or microbands who changed their camps three or four times a year with the seasons (see Fig. 2). As means of subsistence they collected wild plants and they hunted and trapped. Although they hunted such animals as horses and antelope of now-extinct species during the earliest part of the phase, even then most of their meat came from smaller game, such as jack rabbits, gophers, rats, turtles, birds, and other small mammals. In the later part of the phase they trapped only species that exist today. These people, in the so-called "big game hunting stage"[5] or "mammoth-hunting period"[6], were far from being the great hunters they are supposed to have been. As one of my colleagues said: "They probably found one mammoth in a lifetime and never got over talking about it."

Preliminary studies of the pollen and animal bones seem to show that, in this region, the climate of the terminal Pleistocene was only very slightly cooler and wetter than the climate today. The vegetation was probably xerophytic, but not like the present-day desert vegetation in the Tehuacán Valley—it probably was more like the mesquite grasslands of western Texas.

The manufactured tools of this group were not numerous, and all were made by chipping flint. They include a series of bifacially leaf-shaped knives and projectile points, keeled and ovoid end scrapers, flake and bifacial choppers, side scrapers, gravers, and crude prismatic blades struck from even cruder polyhedral cores. No ground stone was utilized, and the floors held few perishable remains, hence we know nothing about the weaving industry or the traps and perishable tools of these peoples. No burials have been found, though there is one fragment of a charred human bone.

This complex (represented by many more artifacts than have been previously found for this time period) seems to be related to the earliest remains found elsewhere in Central America. It must be noted, however, that even at the earliest stage these

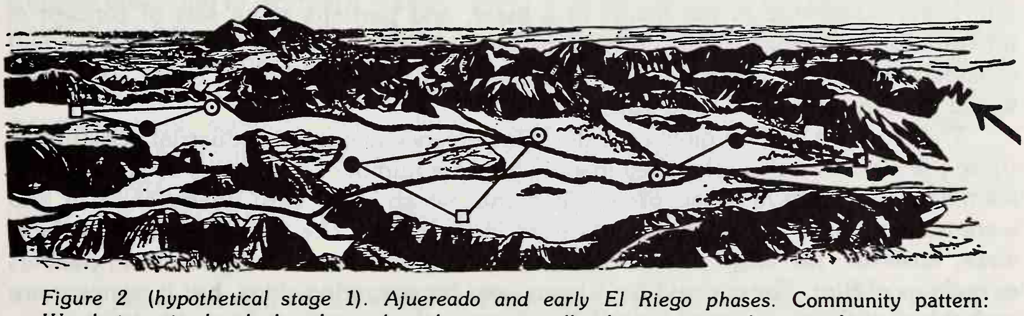

Figure 2 (hypothetical stage 1). Ajuereado and early El Riego phases. Community pattern: *Wandering microbands that changed residence seasonally, that is, groups that went from wet-season camps (●) to fall camps (□) to dry-season camps (⊙) in an annual cycle.* Population estimate: *Three microbands of four to eight people (the original population).* Estimated age: *Before 6800 B.C.* Subsistence: *Food collectors who hunted and trapped and gathered wild plants.* Occupations found: *About 11.*

peoples were not primarily dependent upon hunting and should be called plant and animal collectors rather than hunters. Further, the material culture of the Ajuereado phase continued unchanged even though the Pleistocene fauna became extinct and gave way to modern fauna.

El Riego Phase

Gradually the Ajuereado phase developed into one which we call the El Riego cultural phase. This is extremely well known, for we have dug up 24 floors and have found 14 open camp sites. Ten dates, obtained by the carbon-14 method, allow us to estimate the time of this cultural phase fairly accurately. It seems to fall between 7200 and 5200 B.C. These peoples were seasonally nomadic like their predecessors, but there had been a definite increase in population and some changes in the settlement pattern seem to have taken place. The sites are almost equally divided between very small camps, which obviously represent the family groups or microbands of the dry seasons, and much larger sites, representing camps of related families or macrobands which gathered together in the spring and wet seasons. The means of subsistence was basically plant and animal collecting, supplemented by some hunting—not very different from the previous period, although these peoples seem to have hunted deer instead of horse and antelope, and the cottontail rabbit instead of the jack rabbit.

As for their hunting and trapping activities, there were no fundamental changes; nor do they seem to have been "forçed by the changing climatic conditions that followed the end of the Wisconsin Glaciation to make readjustments"[5]. The preserved plant remains, however, seem to show that plant collecting was even more important than it had been in the previous culture. Nevertheless, it was only a seasonal affair. During the dry season, apparently, people still hunted and trapped in small groups and probably nearly starved, but when the spring came, and later the rains, a number of microbands seem to have gathered together in larger groups to live off the lusher vegetation. There is evidence that they were collecting a large variety of plants, and I would guess that this was the period when they finally conceived the idea that if you drop a seed in the ground a plant comes up. This concept is, of course, basic to any beginnings of agriculture. Further, these people were eating some plants which later became domesticated. These included one variety of squash (*Cucurbita mixta*), chili, and avocados. It is also possible that they were gathering and consuming wild corn as well as utilizing cotton (see Fig. 3).

The development of such a subsistence and settlement pattern undoubtedly caused some changes in their social organization. From comparative ethnological data one might guess that these groups were patrilineal bands with some sort of weak temporary leadership in the hands of a male, and perhaps some sort of concept of territoriality[7]. Further, there apparently were shamans, or witch doctors, who had considerable power in both the medicinal and the ceremonial fields. These, of course, would not have been full-time specialists.

The tools we dug up gave considerable evidence about the industrial activities of these peoples. For example, they manufactured a number of varieties of contracting-stemmed and concave-based projectile points which were very neatly chipped and were probably used to tip atlatl darts used in the chase. The most prevalent artifacts were, however, the large plano-convex scrapers and choppers chipped from pebbles or nodules of flint. These could have been used for preparing skins, but it seems more probable that they were used for pulping various plant remains. Some blades, burins, and end scrapers of types found in the previous horizon were still made and utilized. The most noticeable change in the material culture was the use of ground-stone and pecked-stone implements. Mortars and pestles were particularly numerous, and there

Figure 3 (hypothetical stage 2). El Riego and early Coxcatlan phases. Community pattern: *Microbands that coalesce once a year to form seasonal macrobands, that is, microbands that went from fall camps (□) to dry season camps (⊙) to join others at spring macroband camps (◉).* Population estimate: *Four times the original population.* Estimated age: *6800 to 5000 B.C.* Subsistence: *Plant collectors who occasionally hunted and trapped, and used squash and chili.* Occupations found: *About 40.*

were many milling stones and pebble manos. Tools of both types were probably used to grind up plant and animal remains into some sort of palatable (or unpalatable) stew.

In addition, it is in this period that we found the first evidence of weaving and woodworking—knotted nets, a few small fragments of twined blankets and coiled baskets, fragments of dart shafts, and pieces of traps.

To me, one of the most surprising findings for the El Riego cultural phase was evidence of relatively elaborate burials, which indicate the possibility of complex beliefs and ceremonies. We uncovered two groups of multiple burials. In the first were the skeletons of two children; one child had been ceremonially cremated. The head of the other child had been severed and roasted, the brains had been removed, and the head had been placed in a basket on the child's chest. The other multiple burial included an elderly man, an adolescent woman, and a child of less than one year. There was evidence that the elderly man had been intentionally burned, and the heads of both the woman and the child had been smashed, perhaps intentionally. These findings could certainly be interpreted as some sort of human sacrifice, but the correctness of such an interpretation is difficult to prove. In both these burials the bodies were wrapped in blankets and nets and were richly furnished with basketry. Is it not possible that the ceremonialism that is so characteristic of the later Mexican periods began at this time?

In terms of wider implications, the El Riego phase seems to be related to early cultures occurring in Northern Mexico, the U.S. Southwest, and the Great Basin areas which have been classified as being of the "Desert Culture Tradition"[8]. The later preceramic phases that follow the El Riego phase in the Tehuacán Valley are difficult to classify in this tradition because they have incipient agriculture and the numerous large choppers, scrapers, and milling stones decrease in importance. In addition, these Mesoamerican cultures developed their own distinctive types of grinding tools, baskets, nets, projectile points, blades, and other implements—all unlike artifacts found in the Desert Cultural manifestations.

Coxcatlan Phase

The phase developing out of the El Riego phase was termed Coxcatlan. About 12 radiocarbon determinations indicate that it existed from 5200 to 3400 B.C. Twelve components of this phase were uncovered in cave excavations, and four open camps were also found. Although fewer occupations were found than in the El Riego phase, most of them were larger. However, the way of life may have been much the same,

with nomadic microbands in the dry season and macrobands in the wet season. The macrobands seem to have been larger than those of the earlier phase, and they seem to have stayed in one place for longer periods. Perhaps this was due to their rather different subsistence pattern (see Fig. 4).

While the Coxcatlan people were still basically plant collectors who did a little animal trapping and hunting, all through this period they acquired more and more domesticated plants. Early in the period they began using wild corn, chili, avocados, and gourds. By the middle of the phase they had acquired amaranth, tepary beans, yellow zapotes, and squash (*Cucurbita moschata*), and by the end of the phase perhaps they had black and white zapotes. It seems that microbands still came together at some favorite collecting spot in the spring, and it may be that while they were there they planted some of their domesticates. This would have given them food to continue living at that camp after they had consumed their wild foods. As the numbers of domesticates increased, the group could, of course, have stayed together as a macroband for longer and longer periods. But with the onset of the dry season and the depletion of their agricultural "surpluses" they would have broken up again into nomadic microbands.

The changing subsistence and settlement pattern may have been connected with changes in social organization. The bands may still have been patrilineal. But one wonders whether the use of gardens and the more sedentary way of life might not have resulted in bands having definite collecting territories and ideas about property "garden rights." Moreover, a greater dependence upon agriculture (and rainfall) may have made the shaman even more powerful, not only in medicine and in birth and death ceremonies, but also in regard to rituals connected with plantings and harvestings. In addition, the more sedentary life involving larger numbers of people may have resulted in some kind of macroband leadership, more stable than just that vested in the oldest or most powerful male in a family.

The industrial activities of the group were not vastly different from those of their predecessors, although different types of tanged projectile points were manufactured. Blades were more delicately made, scrapers and choppers were of new types, and true metates, with manos, were replacing the mortars, pestles, and milling stones. Some minor improvements were also made in the manufacture of nets, coiled baskets, bags, and blankets.

The most distinctive aspect of the Coxcatlan phase is its incipient agriculture. However, I do not want to give the impression that Tehuacán was the only early center of plant domestication or agriculture. In fact, our accruing archeological data having to do with the beginning of New World plant domestication seem to indicate that there was no single center, but, instead, that domesticates had multiple origins[9] over a wide area of Nuclear America and the southern United States. For example, while tepary beans and corn may have been first domesticated near or in the Tehuacán Valley, pumpkins seem to have been domesticated in northeastern Mexico, sunflowers in the southwestern United States, potatoes and lima beans in the highlands of South America, common beans in still another region, and so on[10].

Abejas Phase

The Abejas phase follows the Coxcatlan phase, and we estimate, on the basis of eight carbon-14 determinations, that it existed from 3400 to 2300 B.C. Thirteen occupations have now been uncovered, and eight sites were found in reconnaissance. We are now making plans to excavate what seems to be a pit-house village of the Abejas phase.

Figure 4 (hypothetical stage 3). Coxcatlan and early Abejas phases. Community pattern: *Semi-sedentary macrobands that had wet-season fall camps (▣) or annual camps (▪) but that often separated into dry-season microband camps (○).* Population estimate: *Ten times the original population.* Estimated age: *5000 to 3000 B.C.* Subsistence: *Plant collectors who did increasing amounts of agriculture due to new domesticates (first chili and squash then corn then beans and gourds).* Occupations found: *About 30.*

The settlement pattern seems to have changed significantly during this period. Ten of the cave occupations were hunting (dry-season) camps of macrobands, while eight of the macroband settlements were on river terraces in the Valley. The latter appear to have been larger settlements (of five to ten pit houses), and some of them may have been occupied all year round (see Fig. 5). This even more sedentary way of life was made possible by more efficient food production. This was accomplished with plants already known and, in addition, with domesticated canavalia and perhaps pumpkins (pepo) and common beans, as well as some varieties of hybrid corn with teosinte introgression. The people also used cotton and had dogs. However, even with this increase in domesticates, botanical studies and studies of feces reveal that more than 70 percent of their foods still came from wild plants and animals.

Again, many of the older techniques of artifact manufacture continued, though the types are a little different. Some of the types which carry over into much later times originated during this period. These include: split-stitch basketry and the manufacture of stone bowls and ollas, oval metates and large plano-convex manos, obsidian blades made from long cylindrical cores, and other objects.

If this phase provides evidence of a Marxian "Neolithic revolution," the revolution came long after the first plant domestications; the population showed no sudden increase in size, and the artifacts were little better than those of the preceding phase[11].

Figure 5 (hypothetical stage 4). Late Abejas, Purron, and possibly early Ajalpan phases. Community pattern: *Semipermanent villages (❖) composed of a number of microbands living together that occasionally make camps for hunting or planting (△) or collecting (◆).* Population estimate: *Forty times the original population.* Estimated age: *3000 to 1500 B.C.* Subsistence: *Fulltime agriculturists who planted an increasing amount of domesticates. Plant hybridization may have begun.* Occupations found: *About 15.*

Purron Phase

The next phase, Purron, is dated by six carbon-14 determinations which place it between 2300 and 1500 B.C. It is the least clearly understood phase in the sequence and was represented by only two floors in excavation. The excavated materials include a few plant remains, early tripsacoid corn cobs, manos, metates, scrapers, fine obsidian blades, and a number of very crude, crumbly pieces of broken pottery. The pottery, the earliest so far found in Mesoamerica, has the same vessel forms as the stone bowls and ollas of the previous period. This pottery may not be the first modeled in Mexico but only an imitation of still earlier pottery (as yet unfound) in some other area. One might surmise that the subsistence and settlement pattern and social organization of the Purron phase was much the same as that of the Abejas phase.

Ajalpan Phase

The following phase, Ajalpan, dated by 18 carbon-14 determinations, is much better understood. It is placed between 1500 and 900 B.C. Seventeen floors were found in the diggings, and two open sites were found during survey. These Ajalpan people were full-time agriculturists; they planted early hybrid corn, mixta, moschata and pepo squashes, gourds, amaranths, beans, chili, avocado, zapotes, and cotton. They seem to have lived in small wattle-and-daub villages of from 100 to 300 inhabitants. Whether they built religious structures is not yet known, but their figurines, mainly female, attest to a complex religious life. Male priests and chiefs certainly must have had considerable power, although the rich female burials and the figurines hint that kinship and property ownership may have had a matrilineal emphasis (see (Fig. 6).

Many stone tools of the older types were still made, but one of the more notable industries of this period was pottery making. The pottery, though well made, is usually unpainted, although a few examples of monochrome specular-hematite red ware are found. A limited number of forms were modeled; the tecomate, or small-mouthed seed jar, is the dominant type of receptacle.

In terms of cultural relationships, the pottery, large figurines, and rocker-dentate stamp decoration are like those found in the earliest cultural manifestations in lowland Mesoamerica—that is, Veracruz, Chiapas, Pacific-lowland Guatemala, and the Pacific coast of Oaxaca.[12,13] This does not, however, mean there was a migration, diffusion, or relationship only from the coast to the highlands, for remains from periods of comparable age have not yet been found in highland Mexico. In fact, Ajalpan could well be but a local manifestation of an early wide-spread horizon in Mesoamerica. Spinden, many years ago, concluded that such a horizon existed, and he called it the Archaic. More and more evidence confirming his original hypothesis is being accumulated[14].

Santa Maria Phase

In the subsequent Santa Maria period the pottery still shows resemblances to pottery of the Veracruz coast. But in addition to these resemblances it shows resemblances to the earliest pottery remains in Monte Alban[15], the Valley of Mexico[16], and other highland regions.

Thus, we have good evidence for correlating a number of sequences from a number of areas, not only with Santa Maria but also with each other. Twenty-three carbon-14 determinations indicated that the Santa Maria period lasted from just before 900 to about 200 B.C. The culture is well known, for we have excavated 38 components and have found about 15 surface sites. The settlement pattern reveals that

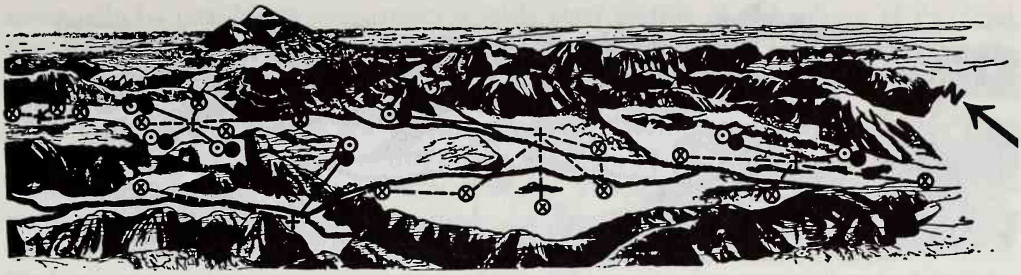

Figure 6 (hypothetical stage 5). Ajalpan and St. Maria phases. Community patterns: *Ceremonial centers or villages with temples (✚) with ceremonially affiliated villages (⊗) and seasonal camps (● ⊙).* Population estimate: *150 times the original population.* Estimated age: *1500 to 200 B.C.* Subsistence: *Full-time agriculturists using many hybrid domesticates. Irrigation may have begun.* Occupations found: *About 60.*

the people lived in small wattle-and-daub houses in villages which were oriented around a single, larger village having ceremonial structures.

These people were full-time farmers, using all of the plants previously known, although many of these plants had been developed into much more productive hybrids. This may be the period in which irrigation was first used.

Although a few new types of chipped stone tools, woven cotton fabrics, and new kinds of ground-stone tools appear, the great majority of the materials we uncovered consisted of pieces of broken pottery. These vessels were well made. They were mainly monochrome (white or grey), though there were a few bichromes. About half of all the vessels found were flat-bottomed bowls; the rest were ollas, water-bottles, composite silhouette bowls, and other forms. Decoration was usually achieved by incising on the interior bottoms of bowls or on the rims or lips, but a few of the vessels have plain rocker stamping, negative painting, and engraving.

Perhaps it was during this period that Mesoamerica became divided into two units, each with a distinctive cultural development[12]. One development, in the lowlands, may have been based on milpa (slash-and-burn) agriculture and have culminated in the development of ceremonial centers, run by a priestly hierachy. The other development may have been based on irrigation agriculture and have culminated in the rise of secular cities. The Tehuacán sequence would be an example of this second type.

Palo Blanco Phase

This Santa Maria phase developed into the Palo Blanco period, dated between 200 B.C. and A.D. 700 by eight radiocarbon determinations (see Fig. 7). On the basis of information and materials from 17 excavated components and from about 150 sites found in survey, we are able to make the following reconstruction about the way of life of the people of this phase. They, too, were full-time agriculturists, and they systematically used irrigation. Besides the previously known domesticates, they had acquired tomatoes, peanuts, lima beans, guavas, and turkeys. They lived in wattle-and-daub villages or hamlets either oriented toward or adjacent to large hilltop ceremonial centers having elaborate stone pyramids, plazas, ball courts, and other structures. Some of these ruins covered whole mountain tops and, in terms of population, might be considered cities, albeit sacred cities. Perhaps these centers were under the authority of priest-kings; if so, the priest-kings certainly must have been assisted by full-time specialists and a hierarchy of bureaucrats, at least to run the irrigation works.

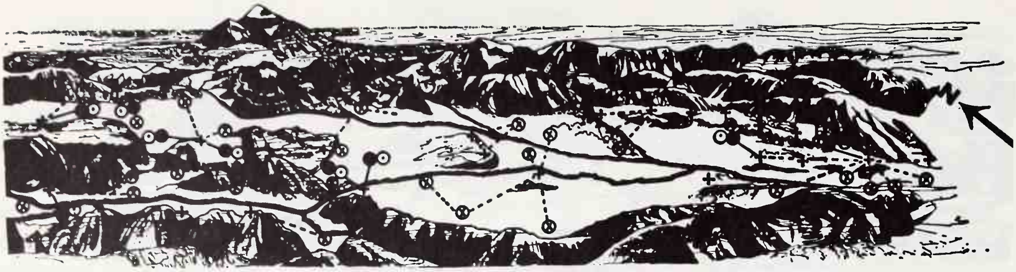

Figure 7 (hypothetical stage 6). Palo Blanco phase. Community pattern: *Sacred cities or ceremonial centers (✚) with villages (ceremonially and politically) affiliated (⊗) and camps (● ⊙).* Population estimate: *1000 times the original population.* Estimated age: *200 B.C. to A.D. 700.* Subsistence: *Full-time agriculturists with irrigation.* Occupations found: *About 160.*

The manufactured products were varied and more elaborate than those of previous phases. The fine grey and orange pottery, the obsidian working, the bark cloth, and the elaborately woven cotton fabrics are particularly distinctive.

In terms of relationships, Palo Blanco seems to be an extension of the Monte Alban III (and IV?) cultures of Central Oaxaca and shows similarities to cultures in the so-called "Classic Period" of Mesoamerica[5]. Why this period in the highlands is considered more "classic" than the later periods has never been satisfactorily explained.

Venta Salada Phase

The final period, Venta Salada, is placed, on the basis of five carbon-14 determinations, between A.D. 700 and 1540 (see Figure 8). Study of the records of early Spanish conquerors of the Tehuacán Valley should shed further light on this phase. Studies made so far reveal that these people were full-time agriculturists who had irrigation. Further, their economy was greatly supplemented by commerce with other regions. Local salt-making and cotton-processing industries made products for exportation. Politically, the Valley seems to have been divided up into a series of little kingdoms each of which had urban centers with surrounding hamlets. Among the manufactured articles were such distinctive artifacts as polychrome pottery, a wide variety of cotton fabrics, bark cloth, chipped stone tools, and arrow points. Since we have excavated over 15 occupations of this final phase and have found about 200 sites in surface surveys, and also have excellent ethnohistorical records available, it will

Figure 8 (hypothetical stage 7). Venta Salada phase. Community pattern: *Secular cities or towns (✱) with (religiously, politically, and economically) affiliated ceremonial centers (✚), villages (⊗) and camps (● ⊙).* Population estimate: *5000 times the original population.* Estimated age: *A.D. 700 to A.D. 1500.* Subsistence: *Full-time agriculturists and irrigation as well as commerce.* Occupations found: *About 210.*

eventually be possible to reconstruct a fairly clear picture of the culture of the final preconquest phase. So far this has not been done.

Conclusion

Obviously, our studies are far from complete, even though some tentative conclusions have been expressed in this article. As more of our data are analyzed and the results are correlated, the total history of the Tehuacán Valley will become better understood. At present, some 30 authors, including myself, are in the process of getting six volumes about our work in Tehuacán ready for publication. Certainly these final volumes will contain information which will permit more perceptive and specific comparisons to be made with other prehistoric cultural developments in Mexico and South America, as well as with sequences in the Old World. Such analysis should lead to more cogent and better documented generalizations about the how's and why's of the rise of civilization than have been expressed heretofore.

—1964

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2. Drs. P. C. Mangelsdorf and W. C. Galinat of the Harvard Botanical Museum and E. J. Wellhausen and R. Hathaway of the Rockefeller Foundation studied the corn remains; Drs. T. Whitaker, senior geneticist of the U.S. Department of Agriculture, and H. Cutler, executive director of the Missouri Botanical Gardens, investigated the prehistoric cucurbits, and Dr. L. Kaplan of Roosevelt University studied the prehistoric beans. Dr. C. E. Smith of the U.S. Department of Agriculture made botanical studies in the Tehuacán Valley; Dr. R. Drake, at the University of British Columbia, identified the shells; and Dr. Eric C. Callen, of McDonald College of McGill University, analyzed the human feces found in the caves. Miss Monica Bopp, and later Dr. James Shoenwetter of the University of Southern Illinois, studied various pollen profiles in the valley to determine ancient changes in climate and vegetation. Dr. Carmen Cook de Leonard of the Centro de Investigaciones Antropologicas of Mexico aided us with her knowledge of the ethnohistory and ethnobotany of the Tehuacán Valley, and Mrs. I. Johnson of the National Museum of Mexico examined the textiles we found in the excavations. Kent Flannery, a student at the University of Chicago, identified the 12,000 archeological bones we uncovered; Dr. J. L. Lorenzo, chief of the Prehistoric Section of the Instituto de Antropología of Mexico, and Dr. J. Moser of the Federal Department of Geology of Mexico surveyed the geology, and Dr. R. Woodbury of the U.S. National Museum, Dr. J. Anderson of the University of Buffalo, and D. Byers of the R.S. Peabody Foundation investigated, respectively, the ancient irrigation systems, the human skeletal remains, and the geography of the Valley. F. Johnson, also of the R. S. Peabody Foundation, carried out a program of dating the archeological remains by the carbon-14 method.
3. The Tehuacán field staff included Mr. Peterson, assistant director; Dr. M. Fowler of the University of Southern Illinois; F. Johnson of the R. S. Peabody Foundation; K. Flannery of the University of Chicago; R. L. Chadwick of Mexico City College; Angel Garcia Cook and A. Arbide of the School of Anthropology of Mexico; and Miss A. Nelken, a student of the Sorbonne in Paris, and her two "Tehuacanero" assistants in the laboratory, N. Tejeda and F. Molina.
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17. The actual investigations were organized under the auspices of the Robert S. Peabody Foundation for Archaeology, Andover, Mass., and were financially supported by generous grants-in-aid from the National Science Foundation and the Rockefeller Foundation. The Tehuacán Project also received support and assistance from the Instituto de Antropología e Historia of the Government of Mexico.

7

Early Sedentary Economy in the Basin of Mexico

by Christine Niederberger

Evidence from archeological excavations in the last two decades has widened our knowledge concerning early post-Pleistocene human communities and the economic strategies, cultural practices, and technological development that led to the establishment of village life.

Curiously enough, the Basin of Mexico, which gave rise to a massive literature on its Pleistocene prehistory and its Classical period[1], has been largely ignored with regard to the time period between 10,000 and 2000 B.C. The general opinion that during that interval it represented a cultural desert or a marginal zone was implicitly or explicitly adopted, as frequently happens when the evidence for a determinant period is lacking. Archaeological excavations at the fossil lacustrine site of Zohapilco[2], in the southern part of the Basin of Mexico, provide new perspectives. They have yielded numerous paleobotanical and paleozoological remains, as well as evidence of human industries, which constitute the first testimony for occupations in the southern part of the Basin of Mexico between the sixth and the second millennia B.C.

In this article I describe the work conducted at the Zohapilco site and discuss hypotheses concerning the processes and conditions under which sedentary life was established in this region. In particular, I examine the possibility of a pre-agricultural sedentary way of life and attempt to define some significant points in the progressive development and change in man-plant relationships in the Basin of Mexico from the sixth millennium onward.

Theoretical Background

Only the two earliest phases of the long archeological sequence[3] uncovered at the Zohapilco site will be discussed here: the Playa phase, dated from 6000 to 4500 B.C.,

and the Zohapilco phase, dated from 3000 to 2200 B.C.[4,5]. Both raise several points of interest.

Specifically, this first discovery of a pre- and protoceramic post-Pleistocene occupation reduces a gap in our knowledge of a crucial period and allows us to explore the regional antecedents of agrarian preurban societies in the Basin[6]. It shows the theoretical weakness of simple diffusionist models that explain the emergence of ceramic cultures in the Basin of Mexico through the sudden intervention of external factors. Such interpretations, which call for a late settlement or colonization, are actually recurrent in the history of research in this region.

Within a more general context, the Playa phase provides evidence that may lead us to discern various trends toward the establishment of a sedentary way of life among Middle-American communities. Especially relevant to this aspect is the fact that the paleoecological characteristics of the southern part of the Basin of Mexico differ radically from those of the semiarid Valley of Tehuacán[7] and of the Sierra of Tamaulipas[8] that have, until now, provided the most important archeological data published on the subject.

Recent archeological syntheses dealing with the transition from a predatory to a production economy have drawn attention to the fact that semiarid bioclimatic contexts alone have furnished data for the geographically varied zone of Middle America. Moreover, these syntheses stress the difficulty of understanding the early processes that led to plant domestication in regions where annual rainfall seems not to have exceeded 500 millimeters[9]. Although these considerations may have somewhat disregarded the specific resources of semiarid regions and the seasonal fertility of restricted ecological niches, such as wet barrancas and valley floors, they have the advantage of demonstrating that, until now, only xerophytic contexts and a priori unfavorable areas have been seriously surveyed. It has been noted[9] that researchers such as Sauer and Braidwood[10], Binford[11], Meyers[12], Bronson[13], and Flannery[14], whose theoretical leanings are often divergent, agree in placing the gradual drift toward plant domestication in optimal bioclimatic zones, where sedentary life and the use of a wide range of plant resources tend to become established early. In another context, an examination of the state of our knowledge on early agriculture led Higgs and Jarman[15] to suggest that our current opinions and interpretations have been biased by the discoveries made in very restricted areas in the Americas and the Near East, which, in the opinion of these authors, leads to "a need for a reconsideration of the situation as a whole."

Data from the Zohapilco site, situated at an altitude of more than 2200 meters in the temperate highlands (Fig. 1) should contribute to attempts to review the conventional evolutionary scheme of nomadic hunter-gatherers becoming sedentary farmers or herders[16], a scheme often considered as an "inappropriate rigid stadial model"[17]. The new data should help to highlight the diversity of processes which gradually led to large permanent settlements in post-Pleistocene times.

Geographical Setting

The southern part of the Basin of Mexico once was filled by a freshwater lake that was divided in two parts, Xochimilco and Chalco, by the construction of a dike during historic times. Its fossil shores, surrounded by volcanic mountain ranges that are mostly basaltic and Quaternary in origin, are located at an altitude of about 2240 m.

Chalco lake covered an area of some 110 square kilometers in the southeastern depression of the Basin before it was completely drained at the beginning of this century. Its riparian soils, rich in peaty components, have preserved numerous

Figure 1. Principal known preceramic and early ceramic zones in Middle America.

archeological testimonies of pre-Hispanic life. Evidence for early Holocene and "Formative"[18] occupations is particularly dense on the fossil lake beaches that stretch along the foot of the eastern slope of the Tertiary andesitic volcano of Tlapacoya (Fig. 2). This ancient volcano, at present a conspicuous physiographic feature in the plain of Chalco, appears in cartographic documents of previous centuries as an island or a peninsula, depending on fluctuations in the level of the former lake.

Some residual stretches of the Xochimilco lake, which formerly covered the southwestern depression of the Basin of Mexico, remain today. Its willow-shaded canals and ponds provide a sample of the varied aquatic and riparian flora and fauna of the past, and its humiferous fertile shores, now under intensive horticulture[19], contrast strikingly with the generally eroded and deforested aspect of the Basin. Above the Xochimilco-Chalco lacustrine plains and the site of Zohapilco rises the imposing Sierra Nevada with its snow-covered volcanic peaks of Iztaccihuatl and Popocatepetl, over 5000 m high, closing the vast Basin of Mexico to the southeast.

Stratigraphy and Early Dates

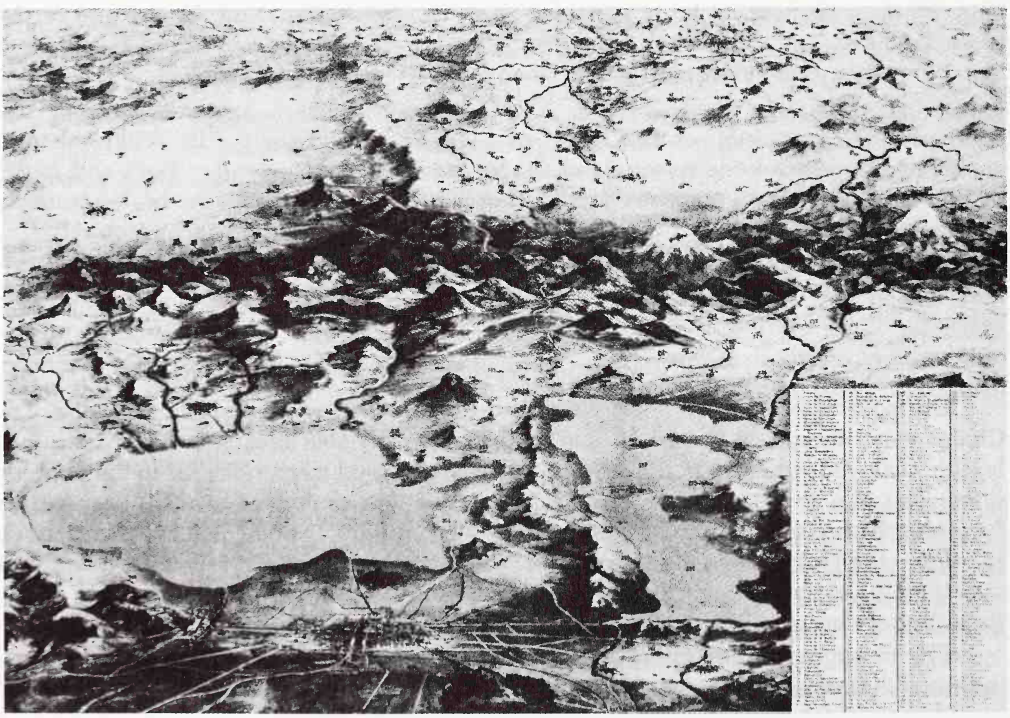
During the last millennia, lake transgressions and recessions in the Basin of Chalco were numerous and of diverse magnitudes. For this reason a trench, 50 m in length, was laid out close to the zone of slope change and perpendicular to the contour lines. The aim was to expose the greatest possible number of successive beaches favorable to human activity. In contrast to most pre-1970 archeological excavations related to the Holocene in the Basin of Mexico, those at Zohapilco followed the natural stratigraphy of the sediments. These formations provide climatic, edaphic, and biotic data that are especially valuable in research related to paleoeconomy.

The stratigraphic column at the site of Zohapilco yields evidence of human communities that occupied the region during 6000 to 200 B.C. Before discussing the first

part of the sequence I shall note briefly the principal volcanic episodes and lacustrine fluctuations that took place in the southern part of the Basin between 12,000 and 6000 B.C., as demonstrated by stratigraphic analysis.

The lowermost layer of the geopedological column examined at Zohapilco is a peat bed dated at 12,750 ± 280 B.C. (GX.0878). This is overlaid by a thick deposit of pumice and andesitic lapilli (Fig. 3, layer 33) that marks the beginning of intense volcanic activity that was rarely interrupted by lake or land sedimentation in the course of the following millennia. Within this volcanic sequence, there is a regional stratigraphic marker composed of a threefold deposit of pumitic ashes. This tripartite volcanic layer (Fig. 3, layer 30) has been indirectly dated by carbon-14 analyses at 7970 ± 220 B.C. (I-6897). At the conclusion of this series of volcanic episodes, an important lake transgression occurred in the Basin of Chalco, leaving a thick and uniform silt deposit (Fig. 3, layer 26) that was very rich in organic matter and diatom frustules.

Figure 2. The Basin of Mexico. An oblique perspective view of the central and southern parts of the Basin in Mexico, made in 1858 by Casimiro Castro. (Courtesy A.F.I.N.A.H.)



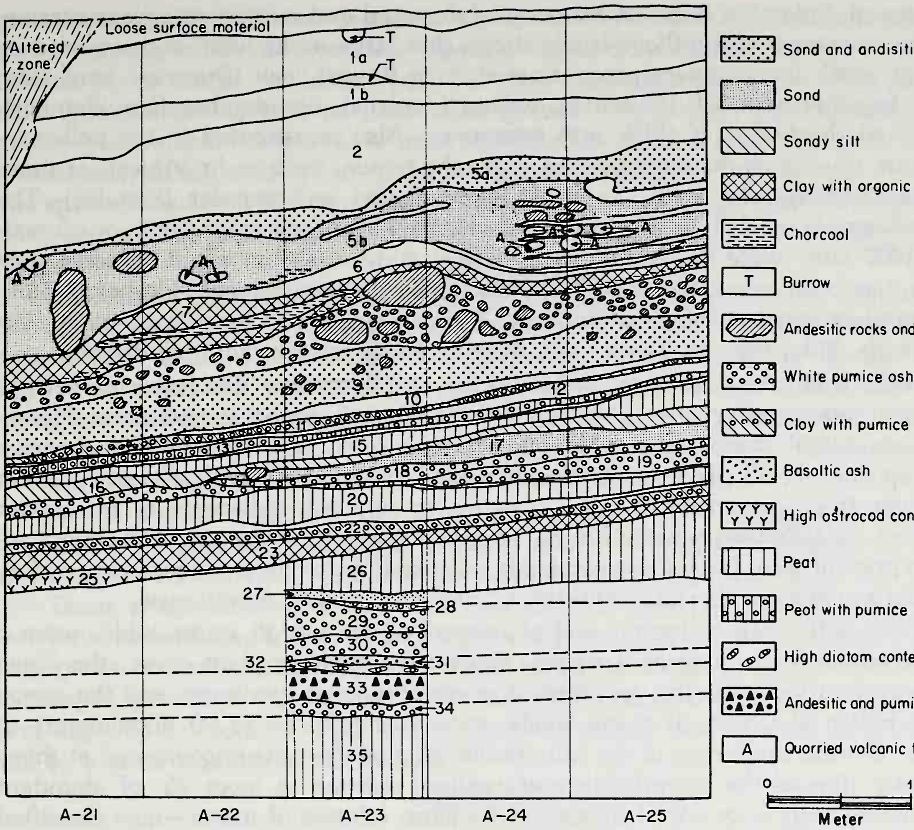


Figure 3. Stratigraphy at the site of Zohapilco, Basin of Mexico. Partial profile of the southwest wall of trench A. The vertical numbers refer to natural geographic strata and excavation units. Only the stratigraphy sequence below layer 13 is discussed in this article.

On the beach that formed over this deposit (Fig. 3, layer 25) and that was composed mainly of oolites and freshwater ostracods, appears the first evidence of post-Pleistocene human occupation at Zohapilco. The 5059 ± 115 B.C. carbon-14 date (I-4405) associated with this beach is the oldest chronological reference for this ancient occupation of the site which I call the Playa phase. By extrapolation of the Clark dendrochronological correction curve[20], this ^{14}C date would give a sidereal date of about 5900 ± 120 B.C. Another ^{14}C date, 4250 ± 125 B.C. (I-4192), from a higher stratigraphic level (Fig. 3, layer 22) was obtained for this long-lasting Playa occupation. Application of the dendrochronological correction, following the Clark curve, gives this later radiocarbon date a sidereal date of 5115 ± 130 B.C.

Two subphases have been determined within the Playa cultural phase. Expressed in sidereal years[5], their estimated range is 6000 to 5300 B.C. for Playa 1 and 5300 to 4500 B.C. for Playa 2.

The Playa Phase: Paleoecology

The Playa phase coincides with an exceptional flourishing of the biota in the southern part of the Basin of Mexico. Study of histograms of early Holocene pollen not only reveals that the southern part of the Basin of Mexico reached its bioclimatic climax between the seventh and four millennia, but also indicates that remarkable continuity and equilibrium of the biocenoses represented.

Although today the Basin of Mexico is deforested and subject to severe erosion, the pollen spectrum of the Playa levels shows that large areas were once covered by forests in which three genera predominated: pine (*Pinus*), oak (*Quercus*), and alder (*Alnus*), together with ash (*Fraxinus*), walnut (*Juglans*), liquidambar (*Liquidambar*), elm (*Ulmus*), hackberry (*Celtis*), and Aceraceae. Also represented in the pollen inventory are trees from the higher zones above the region, such as fir (*Abies*), or those associated with riparian soils, such as willow (*Salix*) and popular (*Populus*). The estimated annual rainfall for this biotope, dominated by a temperate deciduous forest, is over 1400 mm, while the annual mean temperature, with but slight seasonal fluctuations, has been calculated at 20°C[21]. Black haw (*Viburnum*) and elderberry (*Sambucus*) predominated in the shrubby layer. The grassy layer included essentially *Verbena*, *Oxalis*, *Sida*, *Myrica*, *Thalictrum*, *Mitella*, *Heliotropium*, and Acanthaceae.

The lake shores—habitat of fish-eating birds—were densely covered by Cyperaceae mixed with rushes (*Juncus*), cattails (*Typha*), and Sparganiaceae. Horsetail (*Potamogeton*), water lentil (*Lemna*), *Myriophyllum*, and *Epilobium* made up a large proportion of all the floating or submerged aquatic plants. The water of Lake Chalco was fresh, as shown by the presence in riparian sediments of freshwater mollusks of the following genera: *Physa*, *Torquis*, *Helisoma*, *Amnicola*, and *Pomatiopsis*. Also present were freshwater ostracods such as *Potamocypris*, *Cypridopsis vidua*, *Darwinula stevensoni*, *Candona elliptica*, *C. distincta*, and *C. hipolitensis*.

Alluvial soils, rich in humus and characterized by a high water table, were a favorable milieu for wild cereal clusters. Among the riparian plant cover, the Playa pollen spectrum indicates the presence of amaranths, chenopodiums, and the genus *Zea*, the pollen of which, at these levels, measures from 60 to 90 micrometers in diameter. Certain properties of the humiferous alluvial deposits encountered at these levels have allowed the remarkable preservation, starting in layer 25, of abundant plant remains such as grains of teosinte[22]—a close relative of maize—now classified as *Zea mexicana*[23], carbonized seeds of *Amaranthus*[24], seeds of *Physalis*[25], and numerous wood fragments, both in a natural state and with traces of having been worked. The presence of certain plants, such as *Urtica*, in the floristic community of Playa is of archeological interest to the degree that it indicates, together with other evidence, human interference in the occupied area[26].

Mammal remains recovered from these archeological levels include white-tailed deer (*Odocoileus virginianus*), rabbit (*Sylvilagus cunicularius*), the genus *Canis*—dog or coyote, Mexican vole (*Microtus mexicanus*), small rodents of the Heteromyidae (*Liomys irroratus*), and cotton rats (*Sigmodon* sp.). The numerous bone remains of fish belong to three groups, all of them freshwater: that of the white fish and charales of the genus *Chirostoma*, that of the commonly called yellow fish of the genus *Girardinichthys*, and that of the cyprinids.

Among reptiles, the typical lake turtle of Chalco, genus *Kinosternon*, is well represented. Double-fine screening of the Playa sediments allowed us to obtain more than 3000 small bone remains of the amphibian *Ambystoma*[27], called axolotl by the Aztecs who liked its eel-flavored flesh. With the reduction or disappearance of the mountain lakes of Central Mexico, these neotenous amphibians have become scarce, although some specimens are still captured in the Xochimilco area and are prepared with maize dough.

Playa sediments also contain numerous remains of lake birds. Some, like the Mexican duck (*Anas diazi*), are indigenous, but most belong to migratory species that reproduce in the Alaskan deltas or the Canadian prairie provinces and, from November on, migrate south[28]. The Chalco Basin was an important winter nesting

ground during Playa times. Canada geese (*Branta canadensis*), numerous species of ducks—among which are shovelers (*Spatula clypeata*), redheads (*Aythya americana*), pintails (*Anas acuta*), mallards (*Anas platyrhynchos*), and cinnamon teals (*Querquedula cyanoptera*)—as well as pied-billed grebes (*Podilymbus podiceps*) and white grebes (*Aechmophorus* sp.) have been identified in these levels. The American coot (*Fulica americana*), a water hen of the rail family, is also well represented. Nowadays, this species winters in Middle America from September through March or April; however, part of its population remains throughout the year in the interior lakes of Mexico[28].

Concerning the fauna in the Basin of Mexico, the 16th-century Spanish monk Bernardino de Sahagún[29] describes some unsuspected food resources from the lakes during Aztec times. This list includes algae, fly chrysalises, scarab larvae, and the eggs of an insect of the Corisidae family—from which a kind of bread was made—which were collected among the reeds[30]. Sahagún's account underlines the fact that the archeological inventory of permanent or seasonal fauna of the Playa phase, although varied and long, is by no means exhaustive.

At the site of Zohapilco, as well as at numerous other points on the southern lake shores[31], there was a permanent spring of water which left numerous concretions of aragonite and acicular crystals of calcium sulfate in the sediments.

These characteristics of the soils, rainfall, and biotic associations of Playa between the seventh and fourth millennia place the southern part of the Basin of Mexico among the optimal ecological zones. These zones can be defined by the ratio of the number of species to the number of individuals—that is, a diversity index, which is very high; by a productivity per unit of area and unit of time which is also very high; and by a great stability or homeostasis[32].

Lithic Industries

The stone artifacts found on the sixth millennium beaches were fashioned from a variety of raw materials, especially trachytic andesite, the only local rock; in addition, basalt, volcanic tuff, obsidian, and chalcedony were directly or indirectly acquired from different deposits in the high plateau, both near to and far from the site[33]. There are no sources of obsidian in the Chalco-Xochimilco region. Evidence now available indicates that this rock, which is exclusively a black, gray-banded type, comes from Otumba, in the northeast of the Basin of Mexico[34].

The local andesite is the most frequently used raw material in Playa levels. Because microliths and phenocrysts are embedded in its matrix, this rock is difficult to work, but its natural fractures furnish effective cutting edges. Nevertheless, this material was fashioned into standard shapes to make essentially heavy tools. These tools include large bifaces with a terminal bevel: hammerstones; natural slabs with a continuous bifacial retouch along the length of one edge; and large blades struck from elongated cores with a single striking platform. They are associated with numerous utilized flakes and smaller artifacts, also of andesite, among which notched tools and scrapers with a semi-circular working area predominate.

With all types of raw materials, flakes were most frequently produced by what I call the "Zohapilquian" technique. Basalt and chalcedony cores and flakes provide good examples of this technique. Similar to the Old World Clactonian and pseudo-Clactonian techniques[35] that were in use until Neolithic times, the Zohapilquian technique resulted in irregular polyhedric cores being produced with multiple unprepared striking platforms (Fig. 4d), and in flakes whose usually plain butt ends slope toward the dorsal face.

Obsidian is found mostly in the form of small utilized flakes. In the earliest levels of Playa 1, all these flakes exhibit the characteristic Zohapilquian technique: their dorsal ridges form any type of angle with the plane of the butt. From Playa 2 levels come fragments of prismatic blades, which are diagnostic of a unidirectional technique of blade production in which a single striking platform is used. Obsidian projectile points are stemmed with a convex base.

An assemblage of well-manufactured tools was made from olivine basalt, which was widespread in the perimeters of the ancient lake of Chalco and on the island of Xico (Fig. 4, a to c and e and f). Among these tools are notched artifacts, blunt-backed knives, thick scrapers that have a straight working edge and were made from exhausted cores, and keeled and plano-convex scrapers that are subtriangular in outline. Scrapers are sometimes composite tools with a discontinuous proximal retouch forming a cutting edge.

Ground-stone tools related to the preparation of food plants are part of the Playa lithic assemblage. They are made of andesite, basalt, or volcanic tuff. Mullers or manos, the active grinding artifacts, are short; their working surface is flat or slightly convex with an irregular outline describing a circle of a somewhat elongated ellipse (Fig. 4, g to j). Wear patterns identified indicate a rectilinear movement. Milling stone or metate fragments can be classified in two groups: one with a flat grinding surface; the other with a slightly concave working surface. They are made on natural slabs or on artifacts fashioned by pecking. Other ground-stone implements, apparently not related to food processing, include small grinding slabs with rectilinear striations on their worn surfaces; hammerstones also used to pound and crush; abrasive implements; and a tiny effigy-like pisciform sculpture[3].

The lithic assemblage indicates that among the predominant techno-economic activites at the site were forest exploitation with locally quarried heavy bifaces and macro-blades; woodworking with notched artifacts; fine cutting and scraping; stone knapping with a particular skill on non-local basalt rocks; ground-stone pecking; vegetable food processing; other grinding and crushing activities; and manufacturing processes, including abrasive work. Fishing, trapping, and digging implements must have been fashioned mostly out of wood, since Playa levels contain numerous modified wooden fragments. Among them are two sticks with burnt and ground distal end, fragments with groove marks, a piece with terminal bevel, and a small burnished pointed stick, 4.4 centimeters long. Other fragments had the bark removed and show marks of cutting.

Economy and Settlement

Reconstruction of the paleoecology at the site reveals that three exploitable biotopes coexisted in the perimeter of the ancient lake of Chalco: (i) the forest environment, with its wild fruits and mammalian fauna; (ii) the alluvial and riparian zone, with its fertile soils and high water table, favoring the growth of wild grass and other exploitable plants; and (iii) the aquatic environment, rich in plant and animal resources. These biotic associations are remarkable both for the presence of regular resources and for the even distribution of periodic ones, especially between the two major divisions of the Middle-American year, the rainy season (May to October) and the dry season (November to April). They make possible a sedentary way of life well before the development of a truly efficient agriculture. Preagricultural human groups are subject to the same seasonal rhythms as are other polyphageous species[36]. Two cases may be outlined: in the first one, the immediate environment may offer a limited variety of food resources or seasonal cycles. Thus, in the course of the year

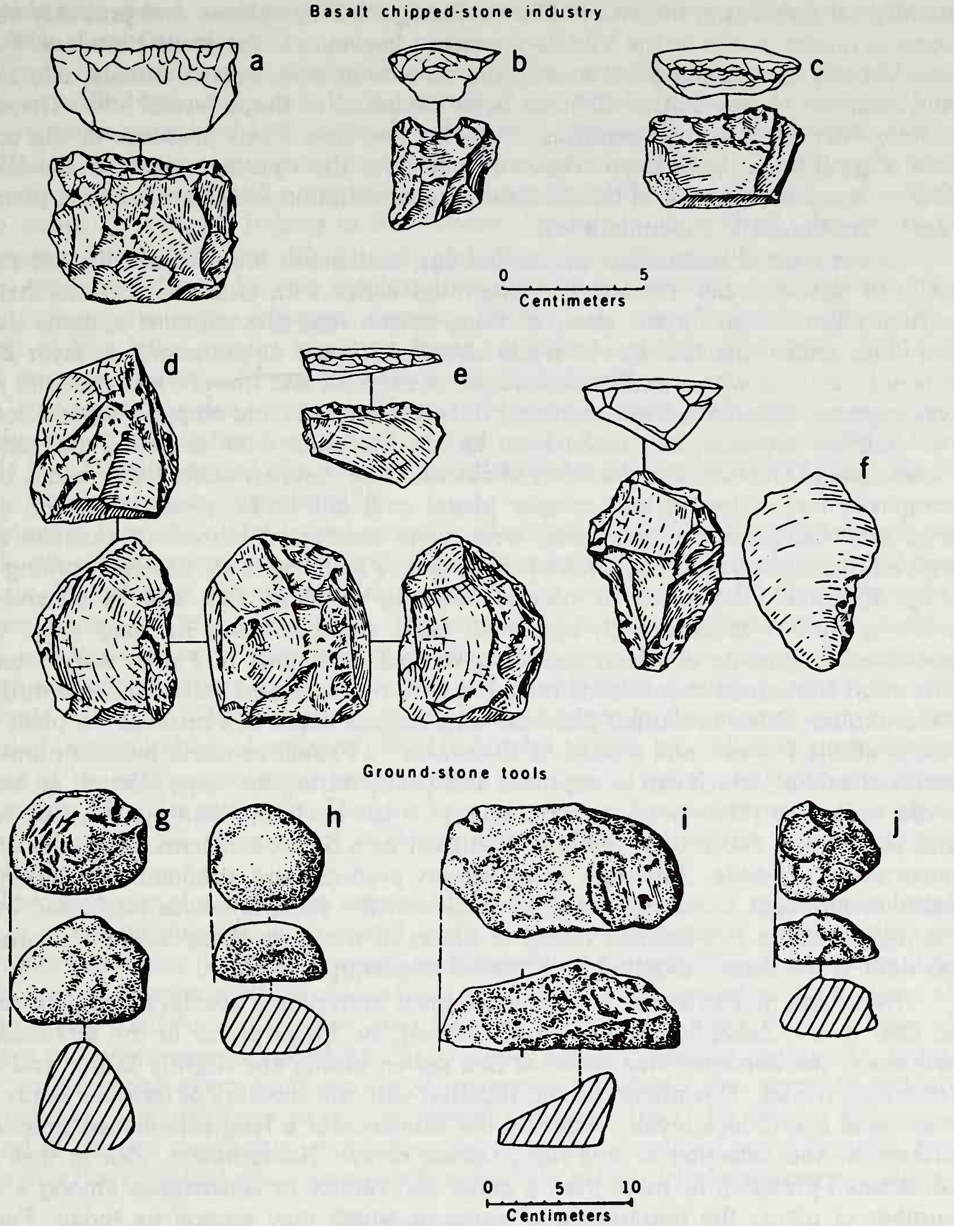


Figure 4. Artifacts of the Playa phase.

there are critical periods when residents must migrate either within the limits of the region, or beyond, in order to exploit other ecological niches. Such compulsory seasonal migrations in relation to the ripening of plants or the recurrence of game were characteristic of the preagricultural societies of the semiarid Tehuacán Valley[37] and the Oaxaca Valley[38, 39]. In the second case, the nearby environment may provide a variety of resources available at different times throughout the annual cycle, thus offering the conditions necessary for territorial permanence. Such conditions were

found on the shores of the lake of Chalco during the Playa phase; and probably also in some estuarian zones in the Middle-American lowlands at the same time level[40].

Various genera stand out among the numerous rainy-season cereals, oily seeds, and aromatic plants that could have been exploited in Playa levels[41, 42]. These are mainly *Chenopodium*, *Amaranthus*, *Physalis*, and *Zea*. Their presence in the collection of grains that have been recovered points to the riparian region of the lake of Chalco as a possible zone of horticultural experimentation with certain edible plants at least from the sixth millennium on.

In the type of excavation we carried out, settlement features are limited essentially to hearth areas. Among the excavated zones with charcoal clusters that are particularly relevant for the study of rainy-season food-procurement systems during the Playa phase, mention can be made of unit A21, and its periphery, in layer 23. In this unit, an area with a high concentration of charcoal and fire-cracked andesite rocks was exposed. Around it were scattered different artifacts and chipped stone discards; two notched artifacts, one made from basalt, the other from andesite; two utilized flakes, one of andesite and the other of obsidian; an obsidian waste flake; and a basalt composite tool acting as end scraper (distal end) and knife (proximal lateral edge) (Fig. 4f). Nearby, and in the same level, were uncovered an oblong andesite mano with a flat grinding face and, on its top surface, a small concave passive working area (Fig. 4i); and a fragment of narrow andesite grinding slab with a passive flat working surface marked with rectilinear wear pattern along its long axis. Well-preserved fragments of wood, including worked fragments of *Pinus*, were found in this area. Numerous burnt seeds mixed in with the sediment were later identified as *Amaranthus*. Other identified plant remains include seeds of *Portulaca*—a plant with fleshy edible leaves—and a seed of *Cucurbita*[43]. Faunal remains include numerous bones of axolotl, which can be captured easily only during the rainy season, as well as snake vertebrae (*Thamnophis*), fragments of turtle shell (*Kinosternon*)[44], fish scales and bones, and two rodent remains identified as a *Sigmodon* femur and a *Microtus mexicanus* mandible. Although rainy-season products are predominant within the biotic assemblage, a multiseasonal occupation in the same area was suggested by the finding, between fire-cracked rocks, of bones of the duck *Anas diazi*, a permanent resident of the Basin, together with typical migratory waterfowl.

Returning now to a broader outlook, I must underline a special trend with regard to *Zea*. In the Zohapilco phase, which follows the Playa phase in the archeological sequence, the average dimensions of *Zea* pollen grains are slightly larger and their frequency triples. This phenomenon, together with the recovery of teosinte seeds (*Zea mexicana*) from Playa levels, suggests the existence of a long-established practice of protection and selection of this rainy-season cereal. Nevertheless, *Zea* at that time constituted probably no more than a minor contributor to subsistence among a large number of plants the importance of some of which may escape us today. For example, wild rice (*Zyzaniopsis*), might have played, I believe, a role in ancient diet. This plant was recently discovered to have been exploited on the lacustrine shores of the Basin of Mexico in the course of the first millennium B.C.[45].

Winter occupation of the site during the Playa phase is clearly indicated by the presence in the kitchen debris of numerous small charred bones of migratory ducks, reliable indicators of dry-season subsistence. Among them, the most common are *Anas acuta*, *Spatula clypeata*, and *Aythya* species. Other waterfowl associated with lithic artifacts include teals (*Querquedula*) and geese (*Branta* spp.). Bones of these migratory birds have been excavated near remains of white-tailed deer.

Such seasonal foods were complemented by a wide range of resources that were

available year-round, such as indigenous waterfowl, and freshwater fish of the genera *Chirostoma* and *Girardinichthys*.

From the quantitative study of ichthyological remains recovered from Playa levels, whether they were left by lacustrine fluctuations or brought by man[46], it appears that a considerable amount of high-quality protein food was available within the Chalco-Xochimilco lacustrine basin. This evaluation yields a direct insight into economic data relevant to Playa subsistence. From the 3473 fish bones recovered from Playa strata, 77 percent belong to the Atherinidae family, specifically identified as *Chirostoma humboldtianum, Ch. jordani*, and *Ch. regani*, 20 percent to the Goodeidae family represented only by one species, *Girardinichthys viviparus*, and 3 percent to the Cyprinidae including *Algansea tincella, Evarra* spp., and *Notropis aztecus*. The habitat of this latter group, known to favor crystalline waters, may have been the small streams that issued from springs overlooking the site.

Canid bones are also present in Playa archeological levels. Although evidence for osteological differentiation from coyote to dog has not been found, the possibility that canids had already started their symbiotic relationship with man during Playa times should nevertheless be considered[47].

In sum, Playa inhabitants had access to clustered diversified biotopes that could supply the whole spectrum of nutritional requirements as well as permanent sources of water. Humiferous and moisture-retaining alluvial soils could fulfill the demand for grasses, fruits, and leafy vegetables. The pine-oak-alder forest provided a productive small and large mammal habitat and an abundant raw material reserve for technological artifacts, shelters, and firewood, and could have played a major role in economic strategies. The occurrence of edible amphibians in the rainy season and the arrival of large numbers of migratory fowl in the dry season, as well as the permanent reserve of lacustrine resources, are all factors that would favor prolonged or permanent residency in the same site. That such permanent residency occurred is indicated, in particular, by the recovery of evidence of multiseasonal activity around hearth areas.

The existence of a sedentary way of life in an aceramic pre- or proto-agricultural context is not inconsistent with recent archeological investigations showing that an agricultural economy is not a necessary condition for the establishment of village life. In this respect, the excavations of Van Loon and Cauvin at Mureybet in Syria, those of Perrot at Aïn Mallaha in Palestine, and those of Perkins and Daly at the village of Suberde in Turkey may be mentioned[48]. The lake site of Zohapilco represents, in my view, an American example of territorial permanence within a pre- or proto-agricultural context. It is important to specify what is understood here by pre- or protoagricultural; I do not mean that elementary horticultural practices were ignored, but rather that their product was economically negligible in the global subsistence system.

The Zohapilco Phase

A lacustrine transgression during the fourth millennium B.C. (sidereal time) seals the Playa levels and interrupts the cultural sequence at the site. In the southern part of the Basin, the end of this millennium was marked by a series of devastating volcanic eruptions. Sent forth in the form of nuées ardentes, they left thick deposits of white cinereous pumice (Fig. 3, layers 18 and 19). This volcanic series, associated perhaps with a slight climatic change, disturbed the equilibrium of the regional biocenosis. Particularly noticeable are the impoverishment of the flora and the consequent degradation of the slope soils which were then invaded by a secondary growth of cacti and xerophytic plants. *Hechtia, Opuntia, Zaluzania*, and *Yucca*, which are typical of rocky outcrops, appear for the first time as a significant component in the

pollen inventory of these levels. A new biotic balance was restored in the region at the beginning of the third millennium as temperate deciduous forests recuperated part of their domain and a marked lake transgression took place. Riparian zones are still covered by Cyperaceae, Juncaceae, and *Typha*; willows (*Salix*), more frequent than in Playa times, sheltered an important plant community of Malvaceae, Liliaceae, and Umbelliferae.

The associated uncalibrated ^{14}C date for the first occupation of the Zohapilco phase (Fig. 3, layer 17) is 2300 ± 110 B.C. (I-4404), which corresponds, following Clark's correction curve, to a sidereal date of 2920 ± 120 B.C. The final occupation is dated indirectly by a ^{14}C date associated with the onset of the succeeding cultural period. This date of 1360 ± 110 B.C. (I-4406)—in sidereal time, 1675 ± 140 B.C.—comes from a peat bed (Fig. 3, layer 13) overlying the deposits with Zohapilco material. From these data, I estimate the temporal extension of the Zohapilco phase to have been between 3000 and 2200 B.C., sidereal time.[5]

The archeological data that define this new phase suggest marked changes in the socioeconomic structures. Nutritional habits and economical behavior have been slowly modified by a long-term trend to produce and control plant resources. Certain relationships with plants that had undergone beneficial morphological changes through time seem to have reached an irreversible point at these levels. As noted above, *Zea* pollen grains from these levels are, on the average, of greater dimensions than those of the previous phase, and their frequency is trebled. Among the cultivated plant remains are found grains of *Amaranthus leucocarpus*, *Physalis*, and *Capsicum annuum*. Pumpkin (*Cucurbita*) and chayote, a plant of the genus *Sechium*, are encountered in the form of macroremains and pollen grains. *Salvia* pollen grains are also present. Slight changes can be perceived in the local faunal population, such as the complete disappearance of *Sigmodon* from the small mammals and the absence of Canada geese from the migratory avian fauna. However, hunting, fishing, and other faunal exploitation patterns do not show fundamental modifications. Bones of game animals, such as the white-tailed deer, remain relatively scarce. Of the abundant exploited local or migratory water fowl, American coots, pintails, mallards, and shovelers predominate. Double-fine screening of occupational sediments yielded numerous remains of axolotl, fish—mainly *Chirostoma* spp. and *Girardinichthys viviparus*—turtles, culverins, and small rodents, all typical of the riparian or lacustrine zoocenosis.

The most significant change in the chipped-stone industries of the Zohapilco phase in relation to those of the Playa phase is the increased proportion of obsidian tools. Although the black, gray-banded obsidian is still by far the most frequent type, a green obsidian of different provenience is also present. This indicates an expansion in the directly or indirectly exploited territory. Some prismatic blade fragments have been recovered from these levels, but the obsidian industry is predominantly represented by numerous microlithic flakes that usually show signs of wear. Some larger flakes were made into scrapers by a series of unifacial regular retouches on their proximal half (Fig. 5e). In others, the working edge was resharpened by bifacial continuous retouch on one or both sides (Fig. 5c). Notched tools and scrapers were also made from basalt as well as andesite. Andesite was used for large blades and hand axes. In all categories of raw materials, chipped-stone artifacts include a high proportion of irregular polyhedric cores and flakes characteristic of the Zohapilquian technique of flake production (Fig. 6, a and b).

A remarkable advance in the manufacture of grinding instruments occurs in the Zohapilco phase levels. These tools appear with a higher frequency and with fully

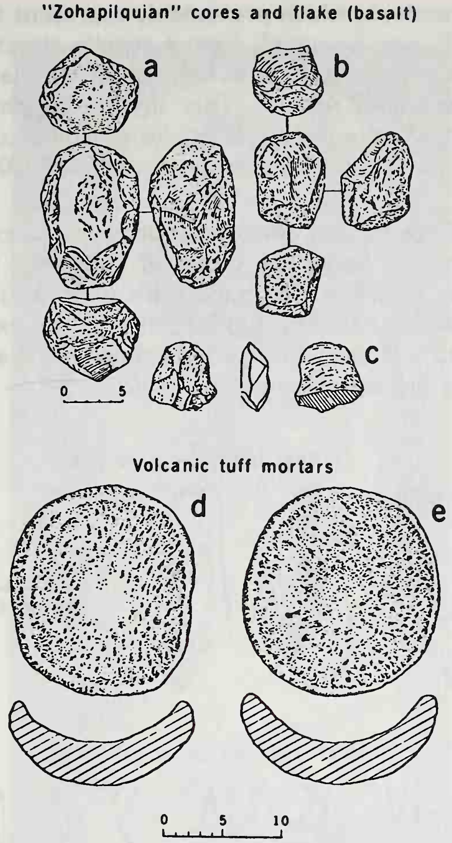


Figure 5. Artifacts of the Zohapilco phase.

standard shapes. They are represented essentially by bifacial manos, subrectangular in outline with two opposed and parallel working surfaces (Fig. 5, i to k) or with opposed worn surfaces that form a dihedral angle, by metate fragments, and by circular to oblong shallow stone mortars made from volcanic tuff (Fig. 6, d and e). Within a group of hearths exposed in an early level of the Zohapilco phase and showing evidence of multiseasonal activity were also found a small andesite crushing slab with a regular depressed area and a spheroid artifact used in manufacturing ground-stone implements. The ground-stone assemblage of Zohapilco levels demonstrates particular skill in pecking work and suggests a marked tendency toward craft specialization.

No fragments of ceramic vessels were found at the site in these levels. Nevertheless, one of the notable events of work in the large hearth area was the discovery in situ of a small baked-clay anthropomorphic figurine (Figs. 5a and 7), indicative of the existence of new conventions in plastic expression and of practices related to a set of beliefs. Mineralogical and petrographic analyses of the paste show that this figurine was made at the site itself. The quality of the paste indicates the existence of non-random techniques for the selection, preparation, and firing of clay. It is difficult to find stylistic equivalents for it, since it belongs to a cultural level which, until now, has scarcely been studied. The head and body form a single armless shaft. The incipient contour that defines the forehead forms a T with the line of the prominent

arched nose. Four depressions, which presumably represent the eyes, make up most of the mouthless face. It may be noted, from a strictly structural point of view, that similar anthropomorphic representations in baked clay are characteristic of homotaxial cultural levels in Eurasia and Africa[3]. This figurine is the earliest found in an archeological context in Middle America; analysis of charcoal fragments, found in close proximity to the figurine, gave the sidereal date of 2920 ± 120 B.C. mentioned above.

In view of the evidence for the emergence of new sociocultural patterns and the presence of an economically important group of cultivated plants, it is difficult to avoid several questions. Of these, the most difficult is: What set of processes can account for the observed shift to food production and can explain how the incipient activities of planting and selection, probably practiced since at least Playa times, had become, by Zohapilco times, a deliberate strategy?

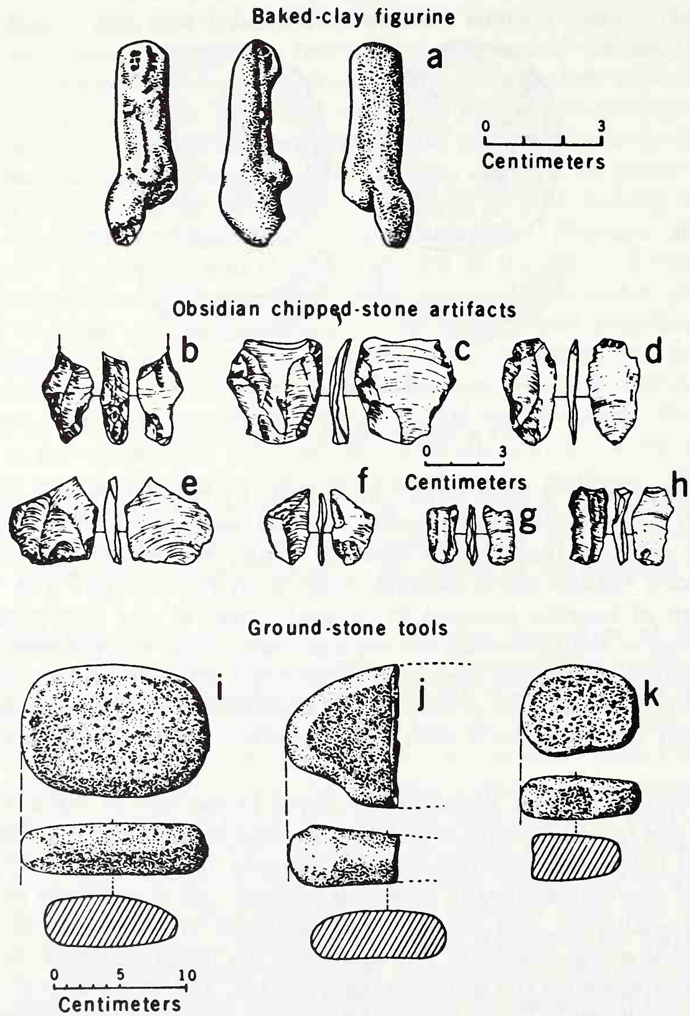


Figure 6. Artifacts of the Zohapilco phase.

Figure 7. Small anthropomorphic representation found in situ within an early level of Zohapilco cultural phase. This baked-clay figurine, associated with the sidereal date of 2920 ± 120 B.C., is the earliest known so far in an archeological context in Middle America.

Several obstacles restrict the exploration of this question. There remain gaps in our knowledge of the early post-Pleistocene sequence in the Basin of Mexico, and the botanical analyses available for the region are still too general[49]. There is also an enormous disparity in our knowledge of the different regions of Middle America likely to have played an important role in the development of agricultural economy; indeed, to attempt to understand the processes involved, it is necessary to go beyond isolated perspectives.

Prudent methodology leads one to exclude simple cause-and-effect mechanistic models that set forth either demographic pressure or changes in the biophysical environment as the sole cause of the emergence of agriculture. A more fruitful approach tends to dynamic equilibrium models of adaptation that bring into play numerous natural and cultural components, in constant and complex interaction[42, 50]. As a consequence, and of special interest here, anthropologists and geographers, such as Harris, have stressed the existence of numerous possible itineraries leading to the crystallization of an agricultural economy[51].

Although a general view remains difficult to achieve for early Holocene Middle America, the first researches into the prehistory of some previously unexplored ecosystems, such as the high lacustrine Basin of Mexico and certain coastal estuary zones, attest to the variety of processes and rhythm leading to the establishment of a sedentary way of life in Middle America. An attempt to define this variety, and some of its implications concerning the development of an agrarian economy, will constitute the essential part of my final comments.

Conclusions

In this description of the southern lacustrine region of the Basin of Mexico I have sressed the importance of the coexistence of a variety of rich biotopes near the lake shores and the year-round distribution of potential resources (Fig. 8)[52]. The joint study of paleozoological and botanical remains and of the evidence of human industries suggests the existence of territorial occupation patterns and food-acquisition strategies that are, in many aspects, different from those proposed for early post-Pleistocene human occupations in Middle America by the archeological researches carried out in the Tehuacán and Oaxaca valleys.

The Tehuacán model implies the existence of rainy-season macrobands (large communities) which were involved in an intensive exploitation of cereals and other plants in seasonally fertile biotopes, and dry-season scattered microbands dedicated to hunting and gathering within dispersed ecological niches[37]. Although some early agricultural practices had been developed during the sixth millennium B.C. with plants such as chili pepper, amaranth, avocado, squash, bean, bottle-gourd, and maize[53], fully sedentary life is thought to have been established in the rainy-season camps at relatively late time levels, more than three millennia later. This interpretation resulted from fieldwork in Tamaulpas, the Valley of Tehuacán, and the Valley of Oaxaca, all situated at altitudes between 900 and 1900 m, in predominantly semiarid climates.

Large areas of Middle America may have followed the Tehuacán model in early post-Pleistocene times; however, at that time, some regions outside this altitude range or ecological framework may have developed different territorial occupation and social organization patterns. In fact, in the lacustrine environment of the temperate highlands, located at an altitude of more than 2200 m, and probably in some estuarian zones of coastal Middle America as well, it would seem that this scheme of socio-economic evolution in post-Pleistocene times, from seminomadic mainly gathering groups to sedentary fully agrarian societies, is not applicable. Artifactual and non-artifactual evidence from the lacustrine shores of the Chalco Basin already suggest the existence of fully sedentary human communities in this region from at least the sixth millennium B.C. (Fig. 9).[54]

It is generally accepted today that there is no clear-cut division between a food-gathering stage and an early well-defined food-production stage in prehistory; rather, the first type of exploitation yields slowly to the progressive advance of the second. Moreover, in Middle America, gathering was still practiced to a significant extent in

Early food resources recovered at the site of Zohapilco (about 5500 B.C.)	Month of availability											
	Dry Season					Rainy Season						
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
Ducks												
Aythya spp.	●	●	●	●	●							
Spatula clypeata	●	●	●	●	●							
Anas acuta	●	●	●	●	●							
Anas platyrhynchos	●	●	●	●	●							
Querquedula sp.	●	●	●	●	●							
Anas diazi	●	●	●	●	●	●	●	●	●	●	●	●
Grebes												
Podiceps caspicus	●	●	●	●	●							
Podilymbus podiceps	●	●	●	●	●	○	○	○	○	○	○	○
Aechmophorus sp.	●	●	●	●	●	○	○	○	○	○	○	○
Geese												
Branta spp.	●	●	●	●	●							
Coots												
Fulica americana	●	●	●	●	●	○	○	○	○	○	○	○
Amphibians												
Ambystoma					●	●	●	●	●	●	●	●
Turtles and snakes												
Kinosternon						●	●	●	●	●	●	●
Thamnophis						●	●	●	●	●	●	●
Fish												
Chirostoma spp.	●	●	●	●	●	●	●	●	●	●	●	●
Girardinichthys sp.	●	●	●	●	●	●	●	●	●	●	●	●
Cyprinids	●	●	●	●	●	●	●	●	●	●	●	●
Mammals												
Odocoileus virginianus	●	●	●	●	●	○	○	○	○	○	○	○
Sylvilagus cunicularius	●	●	●	●	●	●	●	●	●	●	●	●
Canids	●	●	●	●	●	●	●	●	●	●	●	●
Rodents						●	●	●	●	●	●	●
Plants from alluvial soils												
Zea	●									○	●	●
Amaranthus	●										●	●
Cucurbita	●							●	●	○	○	●
Physalis											●	●
Leafy vegetables	○	○					●	●	●	●	●	●

Figure 8. Seasonal and perennial food resources available in the ancient Chalco-Xochimilco lacustrine basin. Closed circles indicate maximum availability; open circles represent minimum availability (see note 52).

historical times within developed and dominantly agricultural economies; thus, early agricultural economies may better be studied in terms of the progressive weight and importance of agriculture in the total subsistence system.

In the Basin of Mexico from the sixth millennium onward, that is, in Playa phase times, agricultural experimentation with different plants, among them *Amaranthus*, *Zea*, and *Physalis*, seems to have been carried out in the humiferous riparian soils. Pollen grain measurements suggest that protection and selection, among other practices, carried out with *Zea* during the subphase Playa 1 were intensified during subphase 2. In addition, a wide range of perennial or seasonal wild plant and animal species that were geographically clustered were exploited, with an apparent preference for lacustrine resources of high nutritional value. The weight of agricultural products in the global subsistence system seems to have been economically weak at these levels. This mixed economy, with a predominance of gathering, hunting, and fishing activities, together with year-round occupation of the same site, suggests that

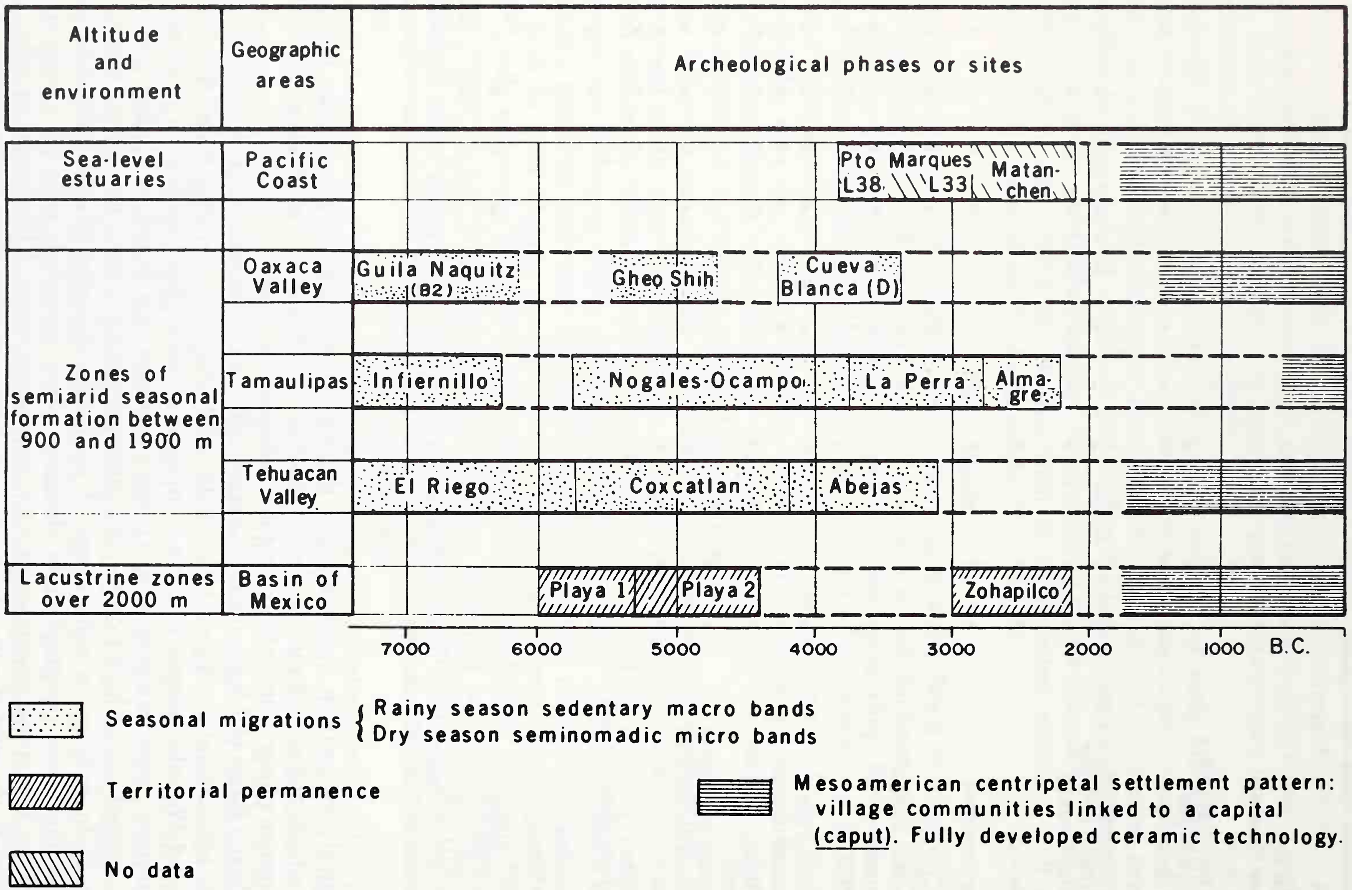


Figure 9. Patterns of territorial occupation in Middle America between 7500 and 1000 B.C. (sidereal time) (note 54).

the communities that settled on the Chalco shorelines represent, within the general studies of sedentary processes, an American instance of territorial permanence within a pre- or protoagricultural context.

This early sedentary economy must have had significant cultural consequences which are difficult to appreciate at this stage of research. On a general level, certain constant and essential characteristics can be attributed to early sedentary settlements; a more acute sense of territorial rights, a systematic arrangement of the inhabited area, certain modifications in plastic expression, and a more integrated sociopolitical organization derived from a stable and centripetal vision of the inhabited space[55]. It has also been argued that the curve of demographic growth rose significantly with the consolidation of a sedentary way of life[56]. The sum of knowledge and practices acquired within the frame of a marked territorial stability would also tend to give increased significance to the incipient manipulations of certain plants, both at a general cultural level and with regard to the appearance of more productive plant races. Such interactions should certainly be considered an important point of departure for the processes leading to the irreversible development of an agrarian economy.

Very few sites are known for the time period corresponding to the Zohapilco phase in Middle America. Both in the long sequence of Tehuacán and in the archeological register of the Valley of Oaxaca, information decreases or disappears between 3000 and 1800 B.C. (sidereal time). Once this gap is filled by future research, it will be possible to place the Zohapilco phase, and the data still to be gathered from these levels, within a wider cultural context.

Work carried out on Zohapilco's fossil shores yields (i) a significant time-depth necessary to an inceptive understanding of the processes that led to the crystallization of a "Mesoamerican" way of life in the Basin of Mexico[57]; (ii) a first insight on regional paleolandscapes and ancient food procurement scheduling and activities; and (iii) an attempt to examine the adequacy for all early Holocene Middle America, and specifically for the Basin of Mexico, of the model of seasonal moves that was set out in the basic pioneer works focused on semiarid regions. The hypothesis of an early sedentary economy in the Chalco-Xochimilco lacustrine basin may require further testing, but in view of the archeological evidence already obtained, it warrants keen attention in this area and in other favorable paleoenvironments of Middle America.

—1979

References and Notes

1. The Classical period is characterized by the development of the large urban center of Teotihuacan.
2. Excavations at Zohapilco were carried out during 1969-1970 under the auspices of the Department of Prehistory of the National Institute of Anthropology and History of Mexico (I.N.A.H.).
3. For details of this sequence, see C. Niederberger, *Zohapilco, Cinco milenios de ocupación humana en un sitio lacustre de la Cuenca de México* (Colección Cientifica, 30, I.N.A.H., Mexico, 1976).
4. These dates are expressed in sidereal time. See (*5*).
5. In (*3*), the temporal extension of the Playa and Zohapilco phases was expressed not in sidereal time but in uncalibrated radiocarbon time, with an estimated range of 5500 to 4500 B.C. for the Playa 1 subphase, 4500 and 3500 B.C. for the Playa 2 subphase, and 2500 to 2000 B.C. for the Zohapilco phase.
6. Data for the preurban "Formative" period in the southern part of the Basin of Mexico have increased in the last decade through intensive surveys and excavations [see J. R. Parsons, *J. Field Archaeol.* **1**, 81 (1974): R. E. Blanton, *Science* **175**, 1317 (1971): P. Tolstoy, J. Field Archaeol. **2**, 331 (1975): _____ and S. K. Fish, *ibid.*, p. 97]. Recent excavations have also been conducted by the Department of Anthropology of the Universidad Nacional Autonoma de Mexico, near Tlaltenco. In the Zohapilco report (*3*), I showed that between 1200 and 800 B.C. (radiocarbon time), during the Ayotla phase and the subsequent phase that I named Manantial, Tlapacoya-Zohapilco became a regional capital in the sense of *caput*, not *urbs*.
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41. My purpose here is not to discuss morphological analyses of plants in Playa alluvial soils, nor to draw an uncertain chronological boundary below which a plant is classified as exploited, although wild in the phenotypic sense, and above which it may be defined as cultivated [see W. Bray (*42*) and K. V. Flannery (*14*)]. Also, I am not concerned here with the search for the origin of domestication of economically important Middle-American plants because data so far recorded for the Basin of Mexico are not sufficient, and because thus stated, the question seems poorly framed; see B. Pickersgill [*Nature (London)* **268**, 591 (1971) My aim is to reconstruct the paleolandscape associated with a dated human occupation and to determine the calendar of potentially exploitable resources and the early food procurement systems.
42. W. Bray, in *Problems in Economic and Social Archaeology*, G. Sieveking, I. H. Longworth, K. E. Wilson, Eds. (Duckworth, London, 1976), p. 107.
43. For these latest determinations, see L. González Quintero (*21*). The *Cucurbita* seed found in unit A21, layer 23, represents the only specimen of this genus identified in Playa levels.
44. P. Huerta and T. C. Alvarez, *Bol. INAH* **11**, 37 (1974).
45. R. Robles and L. González Quintero, *Resultados del análisis botánico de formaciones troncocónicas* (Cuadernos de Trabajo del Departmento de Prehistoria, I.N.A.H., Mexico, in press).
46. J. Alvarez and M. E. Moncayo, *An. INAH* **6** (No. 54), 191 (1976).
47. M. R. Jarman and P. F. Wilkinson [in *Papers in Economic Prehistory*, E. S. Higgs, Ed. (Cambridge Univ. Press, Cambridge, 1972), p. 83] and M. R. Jarman (*17*) have drawn attention to the uncertainty that, during the early stages of dog domestication, man would have created an artificial genetic barrier

between wild populations and humanly controlled isolates in such a way as to induce osteological changes.

48. M. Van Loon, *J. Near East. Stud.* **27**, 265 (1968); J. Cauvin, *Recherche* **39**, 1008 (1973): J. Perrot, in *Supplément au Dictionnaire de la Bible* (Letouzey, Paris, 1968), p. 228: D. Perkins and P. Daly, in *Old World Archaeology: Foundations of Civilization* (Freeman, San Francisco, 1968), p. 105.

49. Thus, the finding of some seeds of wild teosinte (*Zea mexicana*) in Playa levels does not exclude the possibility that, in addition to their interest in wild teosinte, Playa people also disposed of an incipient form of manipulated *Zea*. More palynological studies would be beneficial; such studies have already shown an internally consistent, slow and steady growth in the size of *Zea* pollen throughout all of the Zohapilco site sequence. The early presence of *Zea* in the Basin of Mexico was indicated by the discovery of fossil pollen of this genus in late Pleistocene sediments [see E. S. Barghoorn *et al.*, *Bot. Mus. Leafl. Harv. Univ.* **16**, 229 (1954), and H. Irwin and E. S. Barghoorn, *ibid.* **21** 37 (1965)]. The oldest archeological evidence for well-preserved *Zea* cobs, from the Valley of Tehuacan, dates to 5000 B.C. There has been continued debate concerning the phyletic position of these tiny inch-long cobs, interpreted either as coming from "wild maize," now extinct, or as representing a stage in the transformation of teosinte (*Zea mexicana*) to maize (*Zea mays*), through human selection; or, as evolved from a prototype, ancestral both to maize and teosinte [see P. C. Mangelsdorf, R. S. MacNeish, W. C. Galinat, in *The Prehistory of the Tehuacan Valley*, D. S. Byers, Ed. (Univ. of Texas Press, Austin, 1967), vol. 1, p. 178]. See also (*14*, *23*): W. C. Galinat and L. F. Randolph, *Proc. Am. Philos. Soc.* **121** (No. 3) 1977: R. S. MacNeish, *The Science of Archaeology?* (Duxbury, North Scituate, Mass., 1978), p. 148.

50. W. Bray (*42*); D. L. Clarke, *Analytical Archaeology* (Methuen, London, 1968).

51. D. R. Harris, "Alternative pathways towards agriculture," presented at the Symposium on Origins of Agriculture, Chicago, August 1973.

52. An integrated interdisciplinary approach, the first to have been applied to a late preceramic and Formative site in the Basin, yielded a rich body of data for the Playa, Zohapilco, Ayotla, and Manantial cultural phases. To interpret these data, in particular the annual distribution and seasonal availability of identified plants and animals, I relied on recent studies previously cited and also, to a great extent, on works carried out by naturalists in the Basin of Mexico at the end of the last century, before the occurrence of the ecological deterioration brought about by deforestation and drainage of large lacustrine expanses (C. Niederberger, in preparation). Among these naturists are A. Herrera [*Naturaleza* (*Mexico*) **2a** (Ser. 1), 165 (1888): *ibid.*, p. 299 (1890)]: J. M. Velasco [*Ibid.* **1a** (Ser. 4), 209 (1879)] A. Duges [*ibid.* **2a** (Ser. 1), 97 (1888): *ibid.*, p. 205 (1889)]: S. M. Bustamante [*Mosaico Mexicano* **2**, 116 (1837)]. A simplified appraisal of the food resources available in the earliest levels of the Zohapilco sequence is shown in Figure 8. The position of *Cucurbita* in Figure 8, for example, implies that in early summer the petals could have been incorporated in the diet, as today, while in the second part of the annual cycle, seeds or fruits, or both, could have been consumed. In this case, it is assumed that the cycle was similar to that of the *calabaza de invierno* which grows at present in the Basin. During the two months following the end of the rainy season, the residual humidity of the alluvial soils could assure the survival of a large community of edible plants whose genera have not been detected yet, but which must integrate the various plant families registered in the pollen spectrum. Mammals such as the collared peccary (*Dicotyles tajacu*), tlalcoyote (*Taxidea taxus*), and the American pronghorn (*Antilocapra americana*), which are found in the later ceramic levels of Ayotla and Manantial, should probably be added to the regional resources available during the Playa phase, although they have not been recorded archeologically. Some of the edible invertebrates, including larvae and corixid eggs, which appeared in considerable amounts on the lake surface during the rainy season and which were widely consumed in historic times, could also have figured among the lacustrine resources, definitely predominant in the Playa inventory [see A. Peñafiel, *Memoria Sobre las Aguas Potables de la Capital del Valle de México* (Sria. Fom., Mexico, 1884): L. Coindent, *Le Mexique Considéré au Point de Vue Médiochirurgical* (Paris, 1867): F. E. Guérin-Meneville, *Moniteur Universel* (*Paris*) **330**, 1298 (1857)]. Thus, an attempt to calculate from archeological evidence the total biomass of available rainy-season food resources would certainly lead to a marked sub-standard appraisal. Remains of insects have been recovered in Playa levels (G. Halffter, personal communication).

53. See C. E. Smith, in *The Prehistory of the Tehuacán Valley*, D. S. Byers, Ed. (Univ. of Texas Press, Austin, 1967), vol. 1, p. 220: T. W. Whitaker and H. C. Cutler, *Econ. Bot.* **25**, 123 (1971): K. V. Flannery (*14*).

54. This diagram is based on chronological and cultural data given: R. S. MacNeish *et al.*, in *The Prehistory of the Tehuacán Valley*, R. S. MacNeish, Ed. (Univ. Texas Press, Austin, 1972), vol. 4: K. V. Flannery *et al.* (*39*): C. Niederberger (*3*): M. C. Winter, in *The Early Mesoamerican Village*, K. V. Flannery, Ed. (Academic Press, New York, 1976), p. 227: C. Niederberger, in *Historia de México* (Salvat, Barcelona, 1974), vol. 1: R. S. MacNeish [see (*8*, *37*)]: D. F. Green and G. W. Lowe, *Pap. New World Archaeol. Found. No. 20* (Brigham Young Univ., Provo, Utah, 1967): M. D. Coe and K. V. Flannery, *Smithsonian Contrib. Anthropol.* **3**, 1 (1967): C. F. Brush (*40*): J. B. Mountjoy (*40*). Radiocarbon dates have been converted to sidereal dates following R. M. Clark's correction curve (*20*). To broaden

the scope of this diagram, two recent interpretations on early human occupations on the coasts of Middle America should be considered. One of them concerns the coast of Chiapas where the pattern of territorial occupation for the Chantuto phase, around 3000 to 2000 B.C. (radiocarbon time), is defined by B. Voorhies (*40*) as including "some permanent residences within the zone and periodic influxes of mainland dwellers that perhaps occurred on a seasonal basis." The other interpretation is related to the coast of northern Veracruz and the late preceramic occupation of the Santa Luisa site, in the Lower Tecolutla drainage. For the Palo Hueco phase, around 3600 to 2600 B.C. (radiocarbon time), the Santa Luisa site is considered to represent a year-round settlement in "a village whose economy is based upon collecting, fishing, and hunting in the estuarine, riverine, and forest environments surrounding the site" [see S. J. K. Wilkerson (*40*)].

55. A Leroi-Gourham, *Le Geste et La Parole* (Albin Michel, Paris, 1965), part 2.
56. R. W. Sussman, *Curr. Anthropol.* **13**, 258 (1972).
57. Concerning the trajectory of this Mesoamerican world within the regional perspective of the Basin of Mexico, see W. T. Sanders, *The Cultural Ecology of the Teotihuacan Valley* (Department of Sociology and Anthropology, Pennsylvania State University, University Park, 1965), mimeographed: J. R. Parsons (*6*): R. Millon, R. B. Drewitt, G. L. Cowgill, *Urbanization at Teotihuacan, Mexico* (Univ. of Texas Press, Austin, 1973), part 1: P. Carrasco, in *Historia General de México* (Colegio de México, México, 1976), vol. 1, p. 167.
58. I thank J. L. Lorenzo and L. Mirambell for their continued support during the work. I also thank my colleagues in the natural sciences who analyzed the numerous samples submitted: 'in particular, A. Flores Díaz, pedologist and specialist in freshwater ostracods and gastropods; L. González Quintero, F. Sánchez, and S. Kitchen-Fish, botanists; T. Alvarez, mammalian studies; J. Alverez del Villar and M. Eugenia Moncayo López, ichthyologists; W. Lambert, specialist in volcanic ashes; J. Bradbury, limnologist in charge of diaton studies; P. Huerta, specialist in reptiles and amphibiams; and A. Phillips, ornithologist. I am grateful to I. Kelly and M. Winter for reviewing the manuscript, and other researchers who read it and have also formulated helpful commentaries. I also thank D. Santamaría, archeologist at the Department of Prehistory (I.N.A.H.), for the English translation of the text, originally written in French.

8

The Agricultural Basis of Urban Civilization in Mesoamerica

by Angel Palerm

The idea that a relationship exists between irrigation agriculture and the emergence of pre-Columbian urban civilization in Mesoamerica has been advanced by several writers (cf. Armillas, 1951; Palerm, 1952). The introduction of irrigation agriculture creates the possibility of increased population density. This paper will be concerned with the classification of Mesoamerican agricultural systems in their relation to density of population and types of settlement patterns, rural and urban. Likewise the characteristics of Mesoamerican irrigation will be described and the importance of irrigation in Mesoamerica. Out of these considerations the circumstances which made the Valley of Mexico the core of the Central Area of Mesoamerica will be laid bare.

I. The Agricultural Systems and Settlement Patterns in Mesoamerica

The typology proposed here establishes three fundamental agricultural systems: slash-and-burn (*roza*), fallowing (*barbecho*) and irrigation (considering the *chinampas* as a specialized form of irrigation). Our description is based on historical sources and the techniques used today by some native groups. The data on productivity and demographic concomitants and settlement rely mainly on modern fieldwork, but can be checked against information obtained from historical documents.

The slash-and-burn (roza) system. This consists in clearing a section of the forest at a time propitious to the drying of the cut vegetation which is then set on fire. After the fire, the soil is seeded with a digging stick and later weeded periodically. After a varying but generally short time span, the soil is exhausted and the yield decreases. The field is then abandoned to permit the regeneration of the soil and the

return of the forest. A new section is then cut to continue the agricultural cycle. In a very general way, this is the slash-and-burn system typical of the tropical forest of Mesoamerica.

Tajín, a Totonac settlement of Veracruz, Mexico, gave us an opportunity to study the effects of such a system despite the modifications introduced since the Conquest. They are briefly summarized below. (For detailed descriptions, see Kelly and Palerm, 1952, and Palerm, 1952.)

On the average, each Tajín family cultivates a *milpa* of 1½ hectares, which yields two annual maize harvests. During the initial two or three years the yields are good. After that the *milpa* is frequently replaced by a vanilla patch which requires the growth of some selected trees. After ten or twelve years the field is abandoned and it enjoys a complete rest for 10 or 12 additional years. We thus have a cycle: *milpa*—vanilla patch (with partial return of the forest)—complete rest. This cycle lasts twenty-four years.

The existence of this cycle implies that 12 hectares of cultivable land are needed for each hectare and a half in actual cultivation. These requirements would be smaller in the absence of the maize-vanilla rotation. On the other hand, the vanilla period also allows for the partial regeneration of the soil and the forest, and vanilla growing, by improving the economic condition of the cultivators, decreases the size of the *milpa* required per family.

The agricultural pattern functions successfully as long as the cycle is respected and there is sufficient land. If the cycle be contracted, the regeneration of the soil is not adequate. An increase of population is thus only tolerable up to a certain limit, beyond which land shortages appear. If the cycle is shortened, decreased productivity can be expected. The only solution consists in the emigration of some families in search of new lands.

Naturally, there is a direct relation between population density and the agricultural system, as well as the settlement pattern. The inhabitants can choose between two possibilities: scattered or concentrated settlements. If the latter be picked, the community will tend to cultivate first the land closer to town. In time, the cultivated area is farther and farther away and the distances to the maize fields increasingly inconvenient. Eventually a process of disintegration through small migrations takes place, which may lead to the founding of a new town. Sometimes, again, the migration takes place in a body. Obviously such a system is possible only in the case of small communities. This situation apparently still prevails west of Tajín, in the spurs of the Sierra Madre Oriental.

If a scattered type settlement be selected, the periodic "migration" of the maize fields takes place in a circle around the house, as it does in Tajín. The existence of a small residential nucleus which sometimes functions as a political, commercial and ceremonial center does not modify the dispersion pattern. One hundred sixty-seven families live away from the Tajín residential nucleus and only thirty-five within it.

The "fallowing" (barbecho) system. This method of cultivation also begins with the clearing and burning of existing vegetation. The *milpa* planted on this field retains its productivity as long as the slash-and-burn maize patch, occasionally longer. The important difference consists in the fact that the fallow periods are incomparably shorter. Frequently it is enough for the rest period to match the number of years under cultivation. The main reason for the disparity is apparently environmental. The "fallowing" system is typically found in cool and temperate parts of Mexico.

We had the opportunity to compare this system with that of Tajín at Eloxochitlán,

a Totonac town in the highlands of Puebla, in Mexico. The data are still unpublished. Some of them, dealing with agriculture and some socio-economic aspects can be found in Palerm (1952), and a general summary of the culture in Kelly (1951).

We find two kinds of *milpa* in Eloxochitlán: The garden or *calmil* (the *milpa* of the house) and the *milpa* proper. Both yield only one crop a year. Productivity per harvest of a fallowed *milpa* is pretty much the same as that of a slash-and-burn *milpa*. It is cultivated usually for two or three years and left to rest for about the same period. The *calmil* is harvested annually; it is fertilized with garbage, the dung of domestic animals and with dry leaves and twigs. The yield per harvest from a *calmil* is double that of a slash-and-burn or fallowed *milpa*.

According to our figures (which naturally take into account annual yields as well as productivity-per-harvest), an Eloxochitlán family needs two hectares of *milpa* and a half-hectare of *calmil* in order to reach the annual yield of maize which can be harvested in Tajín from 1½ hectares. But while the cultivation cycle in Tajín demands 12 hectares of cultivable land per family, in Eloxochitlán it requires only six hectares and a half.

Obviously, the agricultural system of Eloxochitlán allows a greater density of population (almost double) than that of Tajín. In addition, the permanent nature of the *calmil* (which lives in symbiosis with the house and acts as its pantry) and the almost perennial "fallowed" *milpa* encourage, if they do not impose, a stability of residence. Almost the whole population of Eloxochitlán lives closely together, within or just outside the political and ceremonial nucleus which contains old, permanent buildings.

The irrigated system. The third element in this comparison is Tecomatepec, a town in the south of the state of Mexico (Palerm, 1952). Here we find, in addition to the fallowing system typical of cool and temperate lands, a recently built irrigation network. Despite such recency, Tecomatepec is located in a zone important for its pre-Hispanic irrigation, which still functions in some places. We found no significant differences between the pre-Hispanic irrigation techniques and those of present-day Tecomatepec.

The water is "bled" from the Calderón river (one of those descending from the Nevado of Toluca), thirty-six kilometers away. A canal (*apantle*) was dug, forty centimeters wide and thirty deep. This work took eleven years. A small dam was then built to intercept the river and redirect part of the water. Maintenance work on this system is continuous. Each rainy period clogs up or destroys a portion of the canal. In addition, some transversal "mouths" of the canal have to be opened, to facilitate the circulation of natural drainage.

Irrigation does not benefit all the inhabitants of Tecomatepec, but rather those who took part in the work. A group of cultivators from Yerbas Buenas, who cooperated with those of Tecomatepec, take part in the maintenance work and use some of the water. In addition to such cooperation between the two towns, special arrangements had to be made with the settlements whose lands are crossed by the canal and with others who share in using Calderón waters.

The need for firm leadership and authority among the irrigation-cultivators of Tecomatepec is evident. In addition to the slow and lasting excavation, the continuous maintenance, the need for formal agreements with other villages, insurance must be made of the equitable distribution of water between neighbors, who take turns at specified times. A system of sanctions for lack of discipline or abuses extends from deprivation of water for a specified period up to complete prohibition.

Productivity of irrigated agriculture (combined at Tecomatepec with a more consistent use of fertilizers) justifies these efforts. The yield is two and a half times

greater than that of fallowed land. Also the same field can yield two crops annually: one with irrigation, the other without. Cultivation proceeds continuously; there is no need to "rest" the soil.

According to our figures, the 1½ cultivated hectares need in Tajín and the two and a half required at Eloxochitlán can be reduced in Tecomatepec to 0.86 hectares. The decrease is even more impressive if we compare the cultivable surfaces need per family: twelve hectares in the slash-and-burn system; six and a half in the fallowing-and-*calmil* areas; 0.86 hectares in those where it is supplemented by irrigation. According to a communication in 1952 by W. Sanders, in a system relying exclusively on irrigation, like the *chinampas*, the requirements would fall to only 0.37 hectares for commercial cultivation, and to 0.6-0.7 for mixed subsistence and commercial cultivation.

The opportunities for a dense population are greatly increased through irrigation. The system also requires a settled home and the concentration of the residents in the irrigated zone. Like other towns in the irrigated region, Tecomatepec is "urbanized" and has permanent, well-planned buildings.

Final comparison and conclusion. We have reported on the relations between three traditional agricultural systems, population density and settlement patterns. A community of a hundred families needs 1,200 cultivable hectares in a slash-and-burn system; 650 of fallowed land and *calmil* gardens; 86 hectares in a mixed system of fallowing and irrigation, and between 37 and 70 in a completely irrigated agriculture (*chinampas*). The corresponding settlement patterns are:

1) dispersed or small migratory settlements, with frequently changing cornfields in both cases;
2) stable residence, at times in hamlets, at times scattered; almost permanent cornfields;
3) and 4) concentrated and thickly-settled communities; permanent cornfields.

II. Irrigation and the Natural Areas of Mesoamerica

The importance of irrigation in Mesoamerica as a fundamental factor in the emergence of an urban civilization can be stated even more emphatically. The earliest urban cultures of the Old World could follow (at least in theory) two alternatives in their agricultural development; either extensive "dry" cultivation or intensive planting with irrigation. Extensive agriculture requires three basic elements unknown in Mesoamerica: the plow, draft animals and adequate means of transport. Maybe one should also add the availability of a metallurgy more advanced than the Mexican. Only a favorable combination of these elements allows the clearance and cultivation of large areas with relatively little labor as well as the necessarily rapid transport of produce in sufficient quantities to feed an urban center.

It seems rather obvious that a rainfall agriculture, never extensive in Mesoamerica, could not accumulate an adequate and constant surplus to maintain the urban centers. It also seems incapable of creating the stimulus required for their development. Both requirements (productive capacity and stimulus) appear with an agriculture based on irrigation, which can develop with a rather primitive metallurgy and in the absence of plows, the wheel or draft animals. Their absence is made up by considerable emphasis on cooperation in work and a measure of political centralization.

Climatic conditions. Our skepticism about the possible relation between rainfall

agriculture and the impressively urban character of Mesoamerica increases when we consider the climatic conditions. (See Vivó and Gómez, 1946.) Whetten (1950, pp. 13-15) has summarized the main difficulties: 1) two-thirds of the total surface of Mexico is mountainous; only one third can be considered more or less a plain; of this third the greatest part is too dry for cultivation; 2) rainfall is inadequate for a flourishing, non-irrigated agriculture; 52.1% of the country's land cannot be cultivated without irrigation; on 30.6% the harvest is uncertain almost every year; 10.5% suffers from drought one year in four or five; only 6.8% of the land receives sufficient rain. To which we would add that a significant part of the latter is clad with tropical forests (where slash-and-burn agriculture is practiced).

Orographic and hydrographic conditions. Roughly speaking, the central part of Mesoamerica has the shape of a triangle. Its northwestern point rests on the mouth of the Santiago river, the northeastern at the mouth of the Pánuco and the southern in the isthmian part of Chiapas. The greater part of this territory (see Vivó 1948; Vivó and Gómez, 1946; Tamayo, 1946) is made up of mountainous plateaus in which the major river systems originate. Its western and eastern limits are set by the mountains which descend toward the Pacific and the Gulf of Mexico. While the Gulf shore is lined with coastal plains of low elevation, the Pacific coast is close to the sharply rising mountains. This peculiar formation accentuates the torrential quality of the water courses. While the Gulf rivers eventually quiet down on the coastal plain (with occasional catastrophic floods), those flowing to the Pacific have no opportunity to even out; they flood regularly and reach the sea in turbulent fashion.

If we relate this situation to climatic conditions the conclusion is obvious. The waters which would be best for irrigation (those in the Gulf area) flow mainly through zones of rainy, tropical forests. The rivers on the Pacific side, where irrigation is frequently indispensable, are almost uncontrollable, in terms of pre-Hispanic technology. Sometimes, though, their periodic floods make possible some agriculture along their inundated banks.

Things are more propitious on the plateaus. Although the terrain is rough and craggy, there are also some flat surfaces. Even if the rivers are mostly torrential they could sometimes have been brought under control, even in the pre-Hispanic period. Irrigation is absolutely necessary in some places and highly desirable in others, because of climatic conditions. Two other reasons lead us to think that the plateaus are the most favorable locus in the Mesoamerican area for the development of civilization: 1) the existence of permanent water courses fed by the melting snows of the *sierras* and the accumulation of subterranean waters; 2) the presence of lakes which play the triple role of ways of communication, a source of food and the basis for the specialized agriculture of the chinampas.

This presentation claims no more than to outline a very general framework within which one can proceed to research and comparison. One could say that the coastal Mexican cultures played a minor role, particularly in the urban period. The key economic, political and military area was on the plateaus.

The natural zones of Totonacapan. Wishing to add something more concrete to this discussion, we thought of commenting on a region well known to us. Totoncapan occurpies a large part of the center of the state of Veracruz, the north of Puebla and the eastern part of Hidalgo; the linguistic limits were defined in Kelly and Palerm, 1952, map 1. We can distinguish several natural areas: 1) a coastal zone, hot and dry, with flat grasslands, forming an arid wedge sunk into the rainy tropical forests of Veracruz; 2) a temperate, rainy belt of hills, lying between coast and sierra; 3) a hot and humid zone of tropical rain

forests located mostly in the mountains; 4) a rainy, cold area in the highlands of the sierra; 5) another cold and high, but arid and semi-arid zone, sometimes reaching desert proportions, west of the sierra.

Examples of the sites characterizing each zone might be: 1) hot and dry: Cempoala; 2) temperate and rainy: Jalapa; 3) hot and humid: Papantla; 4) cold and rainy: Zacatlán; 5) cold and arid: Tulancingo and Perote, the latter a desert variant.

The demographic and urban conditions of Totonacapan. Our study of population distribution in Totonacapan before 1519 (Kelly and Palerm, 1952, p. 11, table 1) indicates that the greatest density was found in the warm and dry area. We estimate 53-63 inhabitants per square kilometer for the two areas of Cempoala and Jalapa (warm and dry and temperate). Working independently, Sanders (1951) arrived at the figures of 75 per square kilometer for Cempoala and 50 for Jalapa. In the northern part of Totonacapan (Papantla excepted), a hot and rainy zone, our figure was 52-56 inhabitants per square kilometer. Sanders, who includes Papantla, calculates 30.

Even more significant is the distribution of population centers. The sources ascribe 80-120,000 inhabitants to Cempoala; 24,000 to Colipa; 60,000 to Papantla; 120,000 to Jalapa, and lower figures, between 4,000 and 8,000 to Almolonga, Chapultepec, Chila, Jilotepec, Matlatlán, Miahuatlán, Naolinco, Tepetlán and Tlacolulan (Kelly and Palerm, 1952, pp. 8 and 9; see also Table 14 of Appendix A).

To what extent can we consider the four larger settlements to be true urban centers? It is quite probable that not all the population was completely urbanized and that the figures include the outskirts and even some none-too-well integrated hamlets. Yet is evident that the 80-120,000 inhabitants of Cempoala are assigned to the city, not to the province, for which we have other figures (250,000 inhabitants; Kelly and Palerm, 1952, p. 8). Also, the first descriptions of Cempoala portray a completely urbanized pattern: houses, palaces, temples, inner courts, streets, plazas, distribution of running water to private houses and gardens, etc. (Kelly and Palerm, 1952, pp. 8, 62, 176). The evidence for Colipa is weaker as we have no data beyond the population figure: 24,000. This undoubtedly could be verified through excavation.

The case of Papantla is quite different. The source (see Kelly and Palerm, 1952, p. 9; Table 14, Appendix A) is ambiguous and the figure quoted could be attributed to either a town or a province; it is unlikely that a city of 60,000 inhabitants would have received so little notice from the chroniclers. Archaeological evidence is also negative. The pre-Hispanic culture of Papantla is not that of an urban society. The *Relación Geográfica* of Papantla (Carrión) describes a scattered population. It is almost certain that Papantla was the ceremonial and political center of a scattered people. It is well described by Torquemada (1:248-9). He indicates, first, that not all the ancient inhabitants of New Spain lived in cities; many lived dispersed and scattered, for example the Totanacs . . . ''But one must notice that in some of these provinces the towns which were the capital or the metropolis of the nation or province were somewhat more ordered than the other towns or settlements subject to them . . . The lord and king lived here and their houses were very luxurious: nearby were the houses of the important and noble folk; and although there were no actual streets, the houses were built with some alignment . . . And such a settlement (somewhat confused and scattered) had one hundred and two hundred houses, sometimes more and sometimes less; the other folk (I mean the rest of the nation or county) who belonged to this capital lived everywhere, over hills and mountains, through valleys and ravines . . .''

The case of Jalapa presents no greater difficulties. The figure quoted (120,000

inhabitants) must be attributed to both a center, with no more than a tenth of the total population, and a series of dependent rural communities and hamlets. Here again we find a description which is likely to be close to the truth. Written by Hernan Cortés (p. 57), it refers to Jico, a town not far from Jalapa: "A well-fortified town, built in a strong place, because it is on the slope of a steep cliff . . . and on the plain are many villages and ranches of about five hundred and three hundred and two hundred cultivators, all in all about five to six thousand warriors . . ."

The remaining places mentioned are more likely villages and towns and not true cities. With Armillas (1951, p. 22), we consider the town, *villa*, an intermediary form between village and city, a transition between rural and urban life.

To summarize: 1) True cities are found in Totonacapan apparently only in the hot and dry region; along with such urban developments we find considerable concentration of towns and the greatest population density. 2) There is no evidence of urban centers in the hot and humid areas; population density was low and settlements scattered with occasional ceremonial and political centers. 3) While we do not find urban centers in the temperate rainy zone, there is evidence of towns and well-planned ceremonial centers, frequently set up as fortresses. To all this we can also add: 4) the cold and rainy area seems to present a situation similar to the temperate and rainy; 5) the pattern of settlement in the cold and dry zone is similar to that of the hot and dry one.

In conclusion, the greatest density of population and the only true urban development in Totonacapan (with its great variety of natural regions) is located in a warm and dry zone, where we also find the only irrigation system known from the Totonac area. One should also mention that irrigation in this zone benefited from some favorable conditions: 1) level terrain; 2) small rivers, an exceptional condition along the Gulf Coast; 3) permanent water courses, coming in part from snows, very infrequent along the Coast (see Tamayo, 1946, pp. 164-166). Urban development may also have been stimulated through trade with the very distinct natural regions nearby, the proximity of the sea and the availability of water transport. In the cold and arid and semi-arid zones there may have existed another urban center (see, for example, Cortés, p. 59) in which the Totonac had apparently little or no part to play.

To what extent can these conclusions about Totonacapan be extended to include Mesoamerica? Our impression is that a measure of careful generalization is possible. We need a Mesoamerican framework which would combine natural areas with the cultural and which would formulate a systematic relationship between cultivation systems, population and urbanization, utilizing ethnographic, historical and archaeological data.

III. Irrigation in the Central Zone of Mesoamerica

It seemed quite obvious that irrigation agriculture provided optimum conditions for urban development in Mesoamerica. We then decided to study the early sources to determine the distribution of irrigation. The following sources were utilized: 1) *Anales de Cuauhtitlán;* 2) *Relación del origen de los indios . . .*; 3) Ixtlilxochitl; 4) Tezozomoc; 5) Cortés; 6) Sahagún; 7) *Epistolario de Nueva España*; 8) Gómara; 9) *Suma de visitas*; 10) Lebrón de Quiñones; 11) *Relaciones geográficas*, and 12) Ponce.

It is impossible to enumerate here all the villages with irrigation which we have identified. We have done so elsewhere (1954). Here we will indicate only the overall results, grouping the villages within the various states of the modern Mexican republic. In Colima - 10; Federal District - 8; Guanajuato - 1; Guerrero - 34; Hidalgo -

19; Jalisco - 50; México - 34; Michoacán - 24; Morelos - 5; Nayarit - 18; Oaxaca - 54; Puebla - 29; Querétaro - 1; Veracruz - 5; Zacatecas - 2: a total of 294.

To this list one should add villages which are reported to have *huertas* (gardens). We assume that *huerta* implies some kind of irrigation. Armillas (1949) has argued in the same sense. The evidence is reinforced by the fact that in the majority of cases the garden under discussion was planted with cacao in regions where this plant needs irrigation (see below). In Colima - 14; Federal District - 3; Guerrero - 8; Jalisco - 9; Michoacán - 1; Morelos - 1; Nayarit - 1; Oaxaca - 2; Veracruz - 1: a total of 40.

The distribution of *cacao* cultivation in Mesoamerica will help us to fill in the outline. Can one say with any certainty that a mention of this crop, even if no "garden" is reported, refers to irrigation? Armillas (1949, p. 88) writes: "at least in the western part of Mesoamerica, when the historical sources refer to *cacao* grown by the natives there is either explicit mention of irrigation or the indirect reference to *huertas* of *cacao*; when we find a reference to *cacao* in this region which does not specify the techniques of cultivation we can be sure that it is accompanied by irrigation."

One must be careful in using such references to *cacao* when they refer to areas other than the ones where irrigation was indispensable. Father Ponce (1:295) emphasizes that "the Indians [plant] their *cacao* orchards where there is water to irrigate them," but he also mentions the province of Yucatan as a place where *cacao* grew without irrigation "in valleys and in wet and shady spots, though there is little of it and it gives little fruit." We could add to Yucatan practically the whole coast of the Gulf of Mexico, although apparently *cacao* cultivation of any commercial importance extended only as far north as the Papaloapan river. We know, for example, that in Usila and Chinantla much *cacao* was grown, taking advantage of the humidity along the riverbanks (Esquivel, pp. 60, 64-67; Quijada, pp. 46, 50). Villages where *cacao* was grown and irrigation seems certain: In Chiapas - 4; Colima - 7; Guerrero - 11; Jalisco - 9; Michoacán - 1; Nayarit - 7; Oaxaca - 3: a total of 42.

A fourth possible list would include the villages where *acequias* (canals and ditches) are mentioned, though without any indication of their irrigating use. Actually *acequias* were used in Mesoamerica for various purposes (communication, defense, drainage, irrigation). Nevertheless, in the cases we have selected the evidence is impressive as they coincide with modern *chinampas* (which are probably also pre-Hispanic) or show some other indirect association with waterworks. Federal District - 4; México - 2: a total of 6.

The overall total adds up to 382 different villages (duplications have been eliminated)—an impressive aggregate if we recall the number of sources used. With the exception of some cases culled from the list of *acequias* the others leave no doubt as to their association with irrigation.

IV. The Antiquity and Importance of Irrigation in Mesoamerica

At least two important questions must be answered before we can definitely relate irrigation to the development of an urban civilization in Mesoamerica: How old is irrigation? What was the level of organization and the importance of these waterworks? We should like to present here some tentative data on this point.

Antiquity. Armillas (1951, p. 24) has suggested that the emergence of urban centers in the Classic Period in Mesoamerica is related to the transformation of agriculture, i.e. irrigation. Two main kinds of evidence seem to support this hypothesis (in addition to the reasons indicated above): 1) the geographic distribution of irrigation; 2) certain archaeological data.

The wide geographic distribution of irrigation may indicate considerable antiquity. Towns practicing irrigation can be found all over the central part of Mesoamerica, with the obvious exception of tropical forests and rainy areas. Outside the central part we find irrigation in the highlands of Guatemala and the Pacific Coast south of the Isthmus of Tehuantepec. Nevertheless, its concentration is greatest in the Valley of Mexico and the headwaters of the Tula, Lerma and Atlixco rivers and in some parts of western Mexico. This clustering and the few irrigated spots in the states of Michoacán and western Guerrero may suggest the possibility of two centers of diffusion: one in western Mexico, the other on the central plateau. This may be due to nothing more than the shortage of data for Michoacán and western Guerrero. According to a personal communication from Sanders in 1952 there may have been another center of diffusion in the highlands of Guatemala.

Other data seem to confirm the suggested relative antiquity of irrigation; Sears' studies of pollen (1951, p. 57) indicate certain fluctuations in the climate of the Valley of Mexico. At the beginning of the Archaic (or Formative) Period the climate was humid, but towards the end of that period it grew progressively drier. This may well be the change which, through its effect on agriculture, stimulated the emergence or extension of irrigation on which the later development of settled centers was based. Another circumstance seems to strengthen the possibility; West and Armillas (1950, pp. 169-170) write that if the *tlateles* of Chalco and Xochimilco are fossil *chinampas* as has been thought, the age of this technique must be Late Ticomán-Teotihuacán I, which falls within the dry period outlined by Sears. Unfortunately, no archaeological excavation has yet been undertaken to determine the true nature of the *tlateles*.

The problem of dating the beginning of irrigation in Mesoamerica can be solved only by archaeological means. The historical sources apparently do not take it any further back than the Toltec era.

The importance of irrigation. The written sources are somewhat more helpful in evaluating the importance of irrigation, not only insofar as its wide geographic distribution is concerned, but also with regard to its significance for particular localities. In writing about the Tacubaya and Coyoacán region, in the Valley of Mexico, López says: "The natives have been seriously injured by being robbed and having been deprived of their estates, lands and water which supported them . . . particularly the inhabitants of Tacubaya and the Otomi of Coyoacán. . . . They had in ancient times taken some water which they brought along the foothills of the *sierra* . . . with which they irrigated their crops in sterile soil and through which they could cultivate many gardens and grow vegetables on which they subsisted, *which waters supported more than twenty thousand of your majesty's vassals*. These waters the President took away from them or damaged the canals, and near one drainage ditch he built three mills with 6 very powerful stones . . ." (p. 187). In describing Cholula, Cortés says: "This city . . . is located on a plain and it has up to twenty thousand houses within the city proper and about as many on the outskirts. . . . It is a city rich in tilled fields as *it has much land and most of it is irrigated*" (pp. 74-75). Cortés also says that the valley of Izúcar is *all irrigated* with very good canals, well traced and coordinated (p. 152; all italics are ours). We do not claim that irrigation was equally important everywhere. It is more likely that the most common variety was the one described by Mota y Escobar (1940, pp. 35-36) who say that "they start ditches and small canals for water from the rivers, in some of the towns . . ."

Once again, archaeology has been of little help so far in the solution of these problems. What do we know of the irrigation system of Cempoala (Gómara, 1:102-103)

which García-Payón seems to have identified recently (Kelly and Palerm, 1952, pp. 99)? And what of those in southern Hidalgo which made possible flourishing centers and a substantial population contrasting with their present poverty? Sauer (1948, pp. 60-61) has shown the importance of irrigation in the valley of Alima, but no archaeologist has followed in his footsteps. The great waterworks (canals, aqueducts, terraces) of the Tetzcutzingo, near Texcoco, Mexico, are still considered by many to have been a resort of King Netzahualcoyotl. Curiously enough when Cook (1949) studied the demographic history of Teotlalpan he did not stop to consider the role of irrigation and its abandonment.

The situation in the Valley of Mexico. If one uses historical sources, at the moment the Valley of Mexico is certainly the best place to study the techniques of irrigation. Despite its alluvial soils, the Valley is not very favorable to agriculture. Its climate has been described as semi-desert, with a relative humidity like that of Pachuca (Hidalgo), and with frequent frosts which add to the difficulties (Gama, 1920, p. 31). The florescence of civilization in this arid valley, covered in part by lakes and swamps, was a genuine product of human effort comparable to that of other ancient civilizations.

The Valley was a closed basin, its bottom a series of lakes. Cortés described it: "On the . . . plain there are two lakes . . . and one . . . is of fresh water and the other . . . salt water. On one side they are separated by a small chain of very high hills located in the middle of the plain and at one end these lakes meet in a narrow plain found between these hills and the high *sierras*. . . . And because this salt lake . . . has flood and ebb times . . . at flood time its water flows to the fresh lake as swiftly as an abundant river and at ebb times the sweet runs to the salt" (pp. 102-103). Gómara adds that "one has nitrous, bitter and pestilent water and the other is sweet and good and fish breed in it. The salt lake ebbs and floods. . . . The fresh is higher; and thus the sweet flows in the bad . . ." (1:247-248).

This means that whenever the lakes formed a single system the waters tended to flow toward Texcoco, the lowest point, until the "vessel" was full, when they flooded the rest of the basin (Gama, 1920, p. 21). The peculiar character of this lacustrian system was due to the fact that some of the waters were fresh while others were nitrous, due to the "slow decomposition of sodic and potasic feldspar which abounds in the rocks of the mountains lining the valley" (Gama, 1920, p. 25). If this had been true of the lakes of Chalco and Xochimilco, of Zumpango and Jaltocan, the whole lake country would have been useless for agriculture, and particularly for the *chinampas*. As the high salinity was confined to the lowest part of the area, the useless section was limited to the eastern side of Lake Texcoco and those areas it reached when in flood, usually western Tenochtitlan.

In addition to topography, the river systems determined which would be the areas most likely to be threatened and damaged by the flood of nitrous waters. While Chalco had good-sized rivers of almost constant flow and Xochimilco used mainly springs, Texcoco was the victim of many strong streams of a torrential nature (Gama, 1920, pp. 25-26). This means that during drought the fresh water (by its altitude and constant supply) flowed toward the nitrous, but in rainy periods (given the torrents and flooding of Lake Texcoco's rivers) the nitrous waters violently flooded the fresh, threatening even the *chinampa* area of Xochimilco.

The techniques used to conquer the lake. The conclusion seems obvious. The use of *chinampas* in the fresh section of Lake Texcoco and even the irrigation of the lower reaches were impossible until a system was figured out and built to con-

tain the flood of nitrous waters. Actually, the problem was even more complicated: the fresh waters also had to be kept at a more or less constant level to avoid the drying of the *chinampas* (which in fact happened after the Conquest) as well as to avoid their being flooded (this was a danger at all times). This applied not only to the sweet section of the central lake, but also to Chalco and Xochimilco and probably Zumpango and Jaltocan. Once the nitrous floods were contained within certain limits, one could start on the gradual conquest of the eastern section of the lake through draining, the rinsing of the nitrous soil, irrigation with fresh water (frequently brought by aqueducts) and the construction of *chinampas*. The latter were used as house sites, cultivated fields, and, where they crossed the lake, as supports for aqueducts.

An outline of the techniques used can be sketched with the help of the sources. The Tenochca completed these remarkable waterworks but there is little doubt that the foundations had been laid by the *chinamperos* of Chalco and Xochimilco and by the Texcocans. We are dealing here with techniques whose roots are deep in the origins of civilization in the Valley. The description of *chinampa* construction has been made by West and Armillas (1950) and need not occupy us here.

The conquest of the lake by the Tenochca. When we first meet them, the Tenochca are established on their island using *chinampa* techniques to increase the available soil (Torquemada 1:290; Tezozomoc, p. 16). This was also done by the Tlatelolcas (Torquemada 1:291). It is doubtful whether these early "*chinampas*" were cultivated fields in addition to being house sites. Tenochtitlan, along with the whole western part of the lake, was open to floods of nitrous water. Economic life during the reign of their early kings (Acamapichtli, Huitzilihuitl and Chimalpopoca) does not suggest agriculture (which they had practiced before, away from the lake). Torquemada (1:92-93; 290) states that they lived poorly and miserably, eating "sea-food" and roots: some of this may be an exaggeration. Their main activities were fishing, hunting, canoe building and war (Torquemada, 1:106). The tribute to Azcapotzalco was made up of "those things which grow in this lake" (*ibid.*, 1:122). Tezozomoc (pp. 24, 62) draws a similar picture. During a quarrel with Azcapotzalco, the Tepaneca chiefs said: "Let us see where they will get the wood which they burn there and the vegetables (crops) which go from our land to Mexico Tenochtitlan to support them" (Tezozomoc, p. 24).

During the reign of Itzcoatl things began to change. Torquemada (1:136) mentions "*sementeras*" (cultivated fields) as part of Tenochtitlan's tribute to the Tepaneca. The appearance of cultivated *chinampas* seems to be related to the construction of an aqueduct to bring water from the springs of Chapultepec (*Relación del origen . . .*, pp. 51-52). The decisive change took place after the defeat of the Tepaneca of Azcapotzalco, when Itzcoatl "had them call the Tepaneca of Azcapotzalco, those of Cuyuacán together with the Xochimilcas and told them: now you have to build, together, a paved highway and road, all of heavy stone, fifteen *brazas* wide and two *estados* high. After the order was heard, it was carried out and there resulted the present Xololco entrance to Mexico City" (Tezozomoc, p. 68). It seems as if this was the first major public work of the Tenochca, planned not only as a means of communication but also as a dike to detain the floods.

Actually, the measures taken by Itzcoatl were insufficient. In the ninth year of the reign of Moctezuma the Elder the city was flooded. The Tenochca appealed to the superior hydraulic skill of the Texcocans and under the leadership of Netzahualcoyotl a new dike was built of lumber and stone. The wall was more than four *brazas* wide and more than three leagues long; the stones had to be brought from three and four

leagues away. Moctezuma had to put to work the people of Tenochtitlan, Texcoco, Tacuba, Culhuacán, Ixtapalapa and Tenayuca. The new construction "prevented the sudden blend of salty waters with those sweet ones" (Torquemada 1:157-158). Another time, as during the reign of Itzcoatl, the building of a highway dike was accompanied by the erection of an aqueduct to take fresh water to Tenochtitlan (*Anales de Cuauhtitlán*, pp. 53-54).

The volume of water thus transferred was soon inadequate and the new king, Ahuizotl, decided to build another aqueduct, from Coyoacán. It has frequently been said that the waters of the aqueduct were used only for domestic purposes. The thirst of the Tenochca seems incredible. The *Anales de Cuauhtitlán* (p. 58) report that when the aqueduct of Ahuizotl sprung a leak, Tenochtitlan was flooded and the waters reached Mixquic, Tlahuac and Xochimilco; even Texcoco was within the flood's radius. Another source (*Relación del origen* . . ., pp. 91-93) indicates clearly that the waterworks were built "to increase the waters of the lake" (in other words, to maintain an adequate level). Tezozomoc (pp. 379-388) tells us that during this period *chinampas* could already be found within the city of Tenochtitlan (see also Torquemada 1:291) and that Ahuizotl ordered the *chinamperos* to plant maize, beans, squash, flowers, chile peppers, tomatoes and trees in "troughs" (*camellones*) so Mexico would "flourish" and the city "did not look like . . . a city . . . but a labyrinth, a flowering garden." This latter aqueduct (built of lime and stone) was erected by the natives of Texcoco, Azcapotzalco, Tacuba, Coyoacán, Xochimilco and "the other four *chinampa*-using towns." The crowd taking part in the work was so numerous "the Indians looked like ants." When the waters reached Tenochtitlan and Tlatelolco, Ahuizotl received them with the following greeting: "You will be used for human sustenance and as a result of the fruits produced by you, there will come many kinds of provisions and flying birds."

We feel there is little ground left for doubt. The cultivated zone was extended by the dike-highway which contained the floods and created reservoirs; fresh water was brought through aqueducts to "wash" the nitrous soil, for irrigation and to maintain the level of the lake in addition to domestic use. When the Spaniards arrived, the system was functioning. Gómara (1:247-248) says that the paved road separating the fresh from the nitrous waters had "six or seven very large openings" through which fresh waters were channeled. He mentions no way of closing these holes which must have existed for use during the floods of nitrous water. This is confirmed by Cortés (pp. 174-175) who, in describing a battle, explains that the Indians opened a "road or dike" from Ixtapalapa to Tenochtitlan and then "the water from the salt lake began to flow with violent force toward the fresh one" (cf. Ixtlilxochitl 1:344). It is obvious that the inhabitants of the Valley (see also Gómara 2:9, 20, for Xochimilco and Jaltocan) had a method of controlling the water flow in both directions through openings in the dike-roads and this method was in active use. Most probably the Tenochca did no more than extend a system used much earlier in Jaltocan and Zumpango, in Chalco and Xochimilco.

In conclusion, we view the development of irrigation in the Valley of Mexico not so much as the result of many small-scale initiatives by small groups, but as the result of large-scale enterprise, well planned, in which an enormous number of people took part, engaged in important and prolonged public works under centralized and authoritative leadership. It is uncertain to what extent this was the general norm in Mesoamerica. We tend to think that usually irrigation was only of local importance, but in certain regions waterworks were built (even if with different techniques) which were similar to those in the Valley of Mexico. Among them are probably those of Cholula

and the valley of Atlixco. Nor should one discard the possibility that local irrigation networks dependent on a common river basin would require the same conditions of cooperation, coordination, planning and authority. This may have been the situation in some parts of Colima, Oaxaca, Guerrero, etc.

V. Some Characteristics of Irrigation and the History of the Valley of Mexico

The case of the Tenochca in the Valley of Mexico was presented as an easily available example, perhaps the culminating one, of the nature and importance of the public works serving irrigation agriculture in Mesoamerica. Nevertheless, it is obvious that the techniques employed were widely used and quite ancient in the Valley of Mexico. It is also obvious that other political units, like Texcoco, Cholula, the Tepanec empire, the Toltecs and certainly Teotihuacan, were in a position to gather and manipulate as considerable a labor force as that which was required by the Tenochca. The volume of human effort and the technical skill represented by the pyramids of Teotihuacan and Cholula are, no doubt, greater than those required for the construction of Netzahualcoyotl's dike (see Armillas, 1951). On the other hand, all during the same period when Itzcoatl began the Mexico-Xololco road, his neighbors of Cuauhtitlán were building a dam to deflect a river and excavating a new bed for it (*Anales de Cuauhtitlán*, pp. 49-50). The monumental structure of Tetzcutzingo, built by the Texcocans date from the same period.

Another characteristic to which Armillas has drawn attention (1951, pp. 21-22), is the "contrast between [the] relatively low technology and [the] highly-developed socio-political structure and intellectual life." This is a real contrast, but not a contradiction. Actually, a strong socio-political organization seems to be the only way open to a people with a poorly-developed technology to have and use large-scale public works. Human labor is the only substitute for advanced technology; the less technology the more human effort is required, which means greater coercive organization. The only possible way of constructing the great pre-Hispanic public works (be they dike-highways, aqueducts, canals or monumental pyramids) in a limited amount of time is reflected for us by Tezozomoc's image, when he talks of large crowds working constantly "like ants" (pp. 378-388).

We also have some additional, more detailed, references. The job of detaining the river of Cuauhtitlán and deflecting it into a new channel was assigned by the chiefs to the inhabitants of Tultitlán. The dam was made of beams, joined and upright; its construction lasted two years. To clean an old canal and make it fit for the new river bed took seven years(see *Anales de Cuauhtitlán*, pp. 49-50). When Cortés asked for the help of Texcoco in order to widen a channel (so as to move the brigantines used in the siege of Tenochtitlan) eight thousand men from the Texcoco kingdom worked daily for fifty days. The finished canal was half a league long (about two kilometers), two *estados* (twelve feet) wide, and about that deep. This required 400,000 man-days (see Cortés, pp. 205-206; Gómara 2:26). We have seen above the number of villages moved to action by the Tenochca kings for their public works.

How can one mobilize such crowds, make them work in organized fashion and maintain them, without a powerful and efficient social structure? In part, the socio-political organization of Mesoamerica was the result or consequence of the low technology and it may be that the low technical development was perpetuated by a social organization which allowed the ready use of such supplies of human labor. In any case, the foundation of this complex relationship rested on irrigation agriculture, the only type capable, under Mesoamerican conditions, of producing the necessary crop surpluses required to feed the thousands who, from time to time, did not work at pro-

ducing their own subsistence. These surpluses were necessarily also great enough to maintain the upper classes and the specialized urban population as well as keep up trading activities. The public works which increased the irrigated surface multiplied the surplus-producing capacity which in turn allowed the use of ever greater quantities of human effort for new works, new urban populations and the growing socio-political organization. Still, all this structuring and economic capacity were not used solely for developing irrigation. They could serve to make war, conquer one's neighbors and develop the historically known empires.

In the regions where irrigation did not acquire the importance it had in the Valley of Mexico, we find a different socio-political situation. Instead of the great concentration of power and the formation of empires we find "city-states" whose control reached rarely beyond a limited constellation of satellites. Coalitions sprang up sometimes but mostly they were at war with each other.

The process may be illustrated through a description of events at Yecapichtla, a town which, with its nine satellites, had about 20-25,000 inhabitabts, about ten percent of whom were *mayeques* and one percent chiefs. It had "many good irrigated lands, and in great amounts." Disputes with neighbors over water were frequent. In early colonial days they complained that if "they irrigated, it cost them a great deal of work as the water comes from Cuavecavazco . . . and many times it is taken away and shut off and not allowed to arrive." And elsewhere: "and granted that it is irrigated with a bit of water which flows through the town of Jantetelco, it [the water] does not come from this town nor does it rise there, but in Tetela . . . and many times it is snatched away by the inhabitants of those towns; this causes great need, and through the loss of the said water they have lost and lose many times . . . some cotton and fruits which they plant" (*Nuevos Documentos* . . . pp. 179, 182, 194, 207).

These circumstances, which can probably be duplicated in many parts of Mesoamerica, may have pushed the "city-states" toward the development of a military organization, slowed down only by the imposition of an "empire" or the formation of temporary coalitions.

The explanation of how the Valley of Mexico could overcome this political situation may possibly be found, not only in the spectacular nature of the public works required for irrigation but also in the easily accessible water transport. The network of lakes made it possible for the Valley to become an economic unit before it was a political one, and to add to itself a part of the valley of Morelos (Armillas, 1951, p. 21). There are countless references in the sources to this special role of the lakes and to numbers and uses of canoes. Gómara (1:248) thinks that there were 200,000 small boats (and perhaps more, as he mentions 50,000 in Mexico alone), carrying people and supplies. When the Texcocans evacuated their city at the arrival of the Spaniards, Gómara counted 20,000 canoes (1:385). Cortés (p. 102) states that most of the trade was carried by boat. Torquemada claims that there was nobody in and around the whole lake who did not have a canoe (1:292).

Much later, at the beginning of the XVIII century, the lakes were still playing a most important role, although land communications had expanded and coaches, horses and mule trains were then in use. A document from Chalco, dated 1806, says: "In this province and town of Chalco, with grief I noted today the great hardships to be seen, it being market day—everywhere a shortage of victuals for survival this coming week; the peasants could not sell their grains and other seeds; the fruit and other precious things *grown in the hot country* could not be sent to the capital. . . . The greens and other foods which we lack and off which other towns live, are rotting near Tlahuac, the lumber of the Royal Factory [is] in the water but cannot move . . .

all this . . . occurs because for four days now the royal canal has been traffic-less as its sides have fallen in . . ." (italics ours). The following is said of Xochimilco: "Since we are in the depths of destitution—not only we ourselves but also our unlucky families—this happening because the royal road is closed on which we communicate with the Capital, whence we receive our daily sustenance. . . ." The petition requests that a new *acalote* or waterway be opened as the old one had been closed by an earthquake (see *Archivo General de la Nación*). Earlier, Cortés (p. 198) had noted the existence of these waterways used for transport at Xochimilco.

This extraordinary coincidence of such different circumstances—some natural and ecological, others geographic, agricultural, technological, political and historic—allow the Valley of Mexico to become the key area of pre-Hispanic Mesoamerica.

—1955

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9

Gardens on Swamps

by Pedro Armillas

A system of shallow lacustrine basins forms the floor of the mountain-girt plateau known as the Valley of Mexico. This was the heartland of the Aztec empire. At the time of the Spanish conquest in 1521, the Aztec capital city Tenochtitlan stood on an island in an embayment of Lake Tezcoco (Fig. 1). To the south, and screened by a range of volcanic cones, extends a subdivision of the valley, the Xochimilco-Chalco Basin. The bottom of this basin encompasses about 200 square kilometers of flats. Until 70 years ago, when the completion of drainage works caused the desiccation of most of the area, a continuous tract of marshes, swamps, and lagoons extended on these bottoms from the eastern head of the basin to the natural outlet that led into Lake Tezcoco through the narrows situated between Culhuacan and Huitzilopochco. Since pre-Columbian times, garden plots raised above water have been built on these swamps. My recent investigation, based on the interpretation of aerial photographs and the inspection on the ground of traces of the old field system, has revealed that the extent of the raised plots in the Xochimilco-Chalco Basin was much greater in the Aztec period than had been recognized (Fig. 2). Also, archeological evidence has been obtained to substantiate the descriptions left by 16th-century witnesses of native land-reclamation methods. The results of the research on this ancient farming system are important in retrospective studies of demography and political economy; their broader significance can be seen in terms of cultural ecology.

The Chinampas

The natives' methods of expanding farmland over swamps and lagoons in the Valley of Mexico were described by a number of early Spanish Colonial writers from

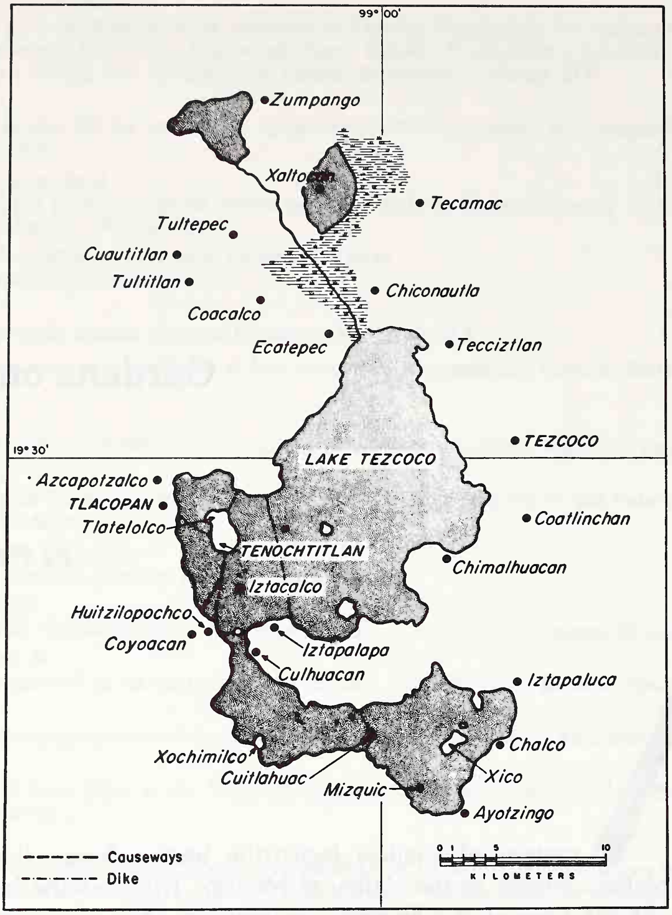

Figure 1. Lake areas and main towns in the Valley of Mexico around A.D. 1500.

the 16th century onward. In freshwater lagoons, wrote one of them, the Indians "without much trouble plant and harvest their maize and greens, for all over are ridges called chinampas; these are strips built above water and surrounded by ditches, which obviates watering."[1] Late in the 16th century, after the disruption caused by the razing of Tenochtitlan and the changes in hydrography due to clumsy attempts at flood control, these garden plots were still farmed by Indians in the outlying wards of Mexico City, the Spanish town rebuilt over the rubble of the destroyed Aztec capital. Within the same embayment of Lake Tezcoco, other areas of chinampas extended around island settlements, such as Iztacalco, and off the shore of the mainland, at Huitzilopochco and Iztapalapa. But at that time, as has been true since before the Spanish conquest, the Xochimilco-Chalco district was unquestionably acknowledged to be the core area of chinampa horticulture.

The pattern and procedure for the laying of these plots, and the essentials of the farming system, are outlined in the following excerpts from 16th-century reports: "they make garden lots . . . carrying in canoes sod cut in the mainland, to heap it up in shallow waters, thus forming ridges from 3 to 4 varas wide (about 2.52 to 3.36 meters) and raised half a vara above the water; a farm has many of these ridges, and the farmers circulate in their canoes between them, to tend the crops";[2] "these plots

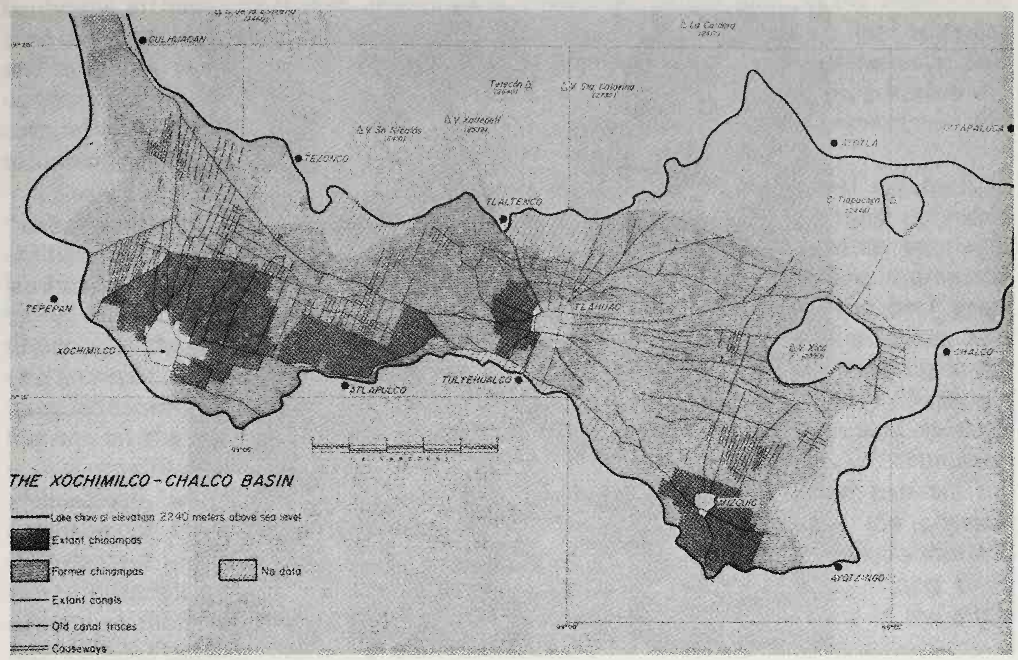

Figure 2. Map of the Xochimilco-Chalco lacustrine basin, showing the extent of ancient swamp reclamation and the remnants of chinampas cultivated in recent times. Some of the blank zones coincide with the location of old lagoons; in other sections, lack of data may be due to erasure of the evidence. Sections of the extant canals seem to have been realigned during the 19th century. (Abbreviations: C. cerro; V, volcan.)

are . . . built upon the water by heaping sod from land and mud from the lagoon, forming very narrow strips . . . separated by canals and, as these gardens are raised less than a vara above the water, even without rainfall they bear vigorous maize, sustained by the moisture provided by the lagoon''; and, ''they set maize seedbeds on the chinampas and they transplant the seedlings, which is a thing peculiar to that country.''[3] Seedlings were also started on floating foundations, according to another witness. These movable nurseries were ''20 to 30 feet long [about 6 to 9 meters] and as broad as the farmer deems convenient, laid on rush, cattail, and sward; on these they set seedbeds for vegetables which are to be transplanted later, and they tow them with ropes from one place to another within the lagoon.''[4] Parenthetically, the legend of the so-called Montezuma's floating gardens (which induced the figment that Aztec horticulture was waterborne and that latter-day chinampas were grounded derelicts) appears to have arisen through errors of observation made by some witnesses who mistook the movable nurseries for the farm plots.

As these reports make clear, the layout of the chinampas was designed to capture moisture. Standing water is essential for the operation of the system. In these artificial islets, the porosity of the soil and the narrowness of the strips allows seepage from the surrounding canals to keep the soil perpetually moist where it counts most, at root level. Permanent irrigation by seepage permits continuous cultivation on the plots, even through the dry season of the year (Fig. 3).

The practice of planting in seedbeds saves space, since the seedlings can be planted in a little corner of the plot or in the farmer's backyard, or on the rafts used in earlier times; it also improves crop yield, since only healthy sprigs are transplanted. The seeding is timed so that the shoots are ready for transplanting immediately after

Figure 3. Chinampa plots at Tlahuac, Federal District, Mexico. Seepage from the surrounding canals allows continuous use of the farmland.

the previous crop has been harvested. Thus the fertile soil is kept in an intensive cycle of production.

To keep the plots under continuous cultivation, the ancient chinampa farmers sustained the fertility of the soil by mucking and manuring, as their descendants still do today. The words for farming practices listed in the 16th-century dictionaries of the native (Nahuatl) language, as well as references by contemporary witnesses, indicate that mucking (scooping from the surrounding canals mud rich in organic nutrients and spreading it over the chinampa) and manuring (with a compost that included aquatic weeds and, probably, night soil too) were common practices in Aztec times.[5]

Plot building on swamps, permanent irrigation, the use of fertilizers produced by the ecosystem, and planting in seedbeds (to intensify the cycle of production) were enmeshed in the system of chinampa horticulture.

Theoretical Underpinnings

The investigation of pre-Columbian undertakings in swamp reclamation in the Xochimilco-Chalco Basin was conceived as an integral part of a more comprehensive research project: the study of man's role in shaping the landscape in the Valley of Mexico through the 2000 years preceding the Spanish conquest (roughly, 500 B.C. to A.D. 1500). This study can shed light on the relations between the growth of civilization and the development of resources (and vice versa) in the region that became the hearth of the Aztec empire.

My project was designed within the conceptual framework of landscape archaeology, which is a relatively new discipline pioneered by British archaeologists. The study of ancient cultural landscapes involves the investigation of all man-made features related to what geographers call the organization of space. The basic tenet of

landscape archaeology is that, through the integration of the data on the features of land use that characterized a man-shaped habitat (including settlement, field systems, and hydraulic works, as well as the layout of the web of trackways, causeways, and waterways that linked the components of the regional system), one can perceive the cultural landscape as a reflection of the interplay between the environment and the technology, structure, and values of the society that shaped it.

Such a study transcends the limitations imposed by the traditional approach to "sites" as discrete units; these units are often conceptualized as the largest definable entities fit for archaeological research. Also, although their subject matter overlaps, landscape archaeology and studies of settlement patterns differ in scope, the former being the broader, the latter often being limited (although not by the best practitioners of the art) to analysis of internal structure, functional differentiation, and size and spatial distribution of towns and villages. The twist that gives meaning to the term landscape archaeology is the emphasis it places on the study of civilization's imprint on the countryside—the modifications of the natural environment through man's constructive and exploitative activities. Finally, in contrast to environmental archaeology, which tends to focus upon the natural aspects of the habitat, the emphasis of landscape archaeology is on man's works to reshape the physical environment in terms of his cultural desiderata. Nevertheless, it is obvious that the two subdisciplines are complementary and that the features distinguishing them depend on their different perspectives on a common subject—the study of the interrelationships between culture and environment.

Because of unending reshaping, the landscape in areas of old civilizations can be pictured as a sort of palimpsest on which the marks of man's efforts to change the natural environment are continually being erased and rewritten, and quite often smudged.[6] It is the task of the landscape archaeologist to map these marks, to date the features, and to discern the functional and historical relationships among them. The goal of these endeavors is to attain a comprehensive view of the man-made environment of a particular period and to trace the evolution of the landscape—its genesis and its fading away as a result of mismanagement, the impact of new technologies, or changing cultural demands upon the environment.

Aerial View, Old Maps, and Footwork

Methodologically, the archaeological investigation of a cultural landscape begins with the interpretation of aerial photographs. The view from the air reveals the faded outlines of many features of the old landscapes—marks that are often hardly perceptible at ground level. Also, by virtue of its synoptic character, the aerial map discloses the relations among the component parts of the intricate patchwork that constitutes the living landscape, and it affords clues for interpreting these features in terms of their historical development. I started by scrutinizing a large number of aerial maps and sets of stereographs produced commercially by the Compañía Mexicana de Aerofoto. The earliest of these pictures were taken in the late 1930's. They are now historical documents of exceptional importance because, since the late 1950's, the obliteration of vestiges of the ancient cultural landscape has been rapidly accelerated by construction and deep plowing. However, traces of the old chinampa system are shown in rich detail in more recent aerial photos of the less disturbed sections.

A mosaic at the scale of 1:25,000 provides an overview of the whole Xochimilco-Chalco Basin. One can trace on this picture the old shorelines and the cobweb of through-traffic waterways that formed the arterial system of regional transportation. It was used as the base map on which were plotted details of the ancient pattern of land

use taken from larger-scale pictures. Also, most of the area included in my survey is covered by sectional photomaps at the scale of 1:10,000. This scale proved adequate not only for identifying the marks of the grid of feeder canals that crisscrossed the zones of chinampas and divided them into blocks of parallel plot-and-ditch sets, but even for counting ridges on each block. In addition, the advantage of photographs taken at a low altitude was tested on a 4-square-kilometer area northeast of Xochimilco (the area was chosen after having been explored on foot and photographed for my project by Compañía Mexicana de Aerofoto). On these photographs, the outlines of the ancient field system are shown as shadow marks on ground that has not been completely leveled by plowing (Fig. 4). Also, the parallax allows one to see on the stereographs the relief of the ridges formed by eroded chinampa strips, the low mounds where the farmhouses stood, and the shallow grooves that reveal the clogged ruts of old canals. Of course, only weed marks—produced by the differential growth of plants on the former plot and along the ditches—can be seen on repeatedly plowed surfaces; but it is in these sections that the palimpsest effect created by the overlaying of present field boundaries on the old chinampa grid is most strikingly shown by aerial photography (Fig. 5). Even without enlargement, the scale of the contact prints (approximately 1:5000) allows delimitation of separate farm units, through correlation between isolated farmsteads and blocks of chinampa strips, and makes it possible to measure with reasonable accuracy the size of the landholdings.

Old maps were consulted too, but none of the early ones helps to plot the extent of swamp reclamation in the Xochimilco-Chalco Basin at the time of the Spanish conquest. The best mid-16th-century general chart of the Valley of Mexico (the pictorial

Figure 4. Shadow marks of old chinampas in a still unplowed section to the northeast of Xochimilco; the ridges at the upper left are shown in Figure 6 [top]. Approximate scale, 1:5000; the top of the photograph is the southeast. (Aerial photograph taken by Compañía Mexicana de Aerofoto.)

Figure 5. Weed marks of old chinampas in plowed fields. Notice the parallel alignments of marks and the blocks outlined by former service canals at the bottom of the picture. Approximate scale, 1:5000; the top of the photograph is the southeast. (Aerial photograph taken by Compañía Mexicana de Aerofoto.)

map preserved at the University of Uppsala) portrays the tract of marshes and the layout of the main canals across them, as well as the island-towns and the causeways that linked Cuitlahuac to the mainland—but it does not depict the garden plots. The gross acreage of chinampas does not seem to have been delimited on maps until the 19th century, long after the upsetting of the ecosystem had reduced the areas of chinampa horticulture to a fraction of their peak size. Nevertheless, the search through old maps produced important information about hydrologic conditions before they were changed by artificial draining of the basin.

In several maps drafted during the 18th and 19th centuries, the areas of standing water within the zone of swamps were clearly demarcated. A comparison among different versions made over a 120-year period shows general agreement as to extent and location of the pools; these were permanent features determined by the relief of the area. Obviously the information on water depths is important in my study. It is noteworthy that the distribution of ghosts of ancient chinampas on aerial photographs corresponds to the swamp zone represented on these 18th- and 19th-century maps, but such marks are missing on the old beds of major lagoons where deeper water precluded the building of raised plots.

The indications of past land use that one spots on the aerial photographs have to be identified and dated through the field survey, which must be performed on foot—one misses the "ground truth" when riding in a jeep. Walking over the surface of old chinampas, one can feel, through the soles of one's boots, revealing differences in soil texture or the slight undulations of the ground. This is pedestrian archaeology, but it works. On ground that has never been plowed, the raised strips of former chinampas

can be seen to form parallel ridges that simulate a huge washboard, but in most places the ridges eroded or have been completely flattened by plowing after the area has become desiccated (Fig. 6). In general, the ghosts of the chinampas are outlined by rows of hydrophilic weeds, which thrive along the filled ditches between chinampas, or they may show as soil or moisture marks (depending on the season in which they are observed).

Swamp Dwellers in the Perspective of Time

Although lakeside settlements were numerous and important, it appears that in Aztec times a plurality of chinampa tillers dwelt in the middle of the swamps, rather than on the shore of the mainland. The island-towns of Mizquic, Cuitlahuac, and Xochimilco were mentioned by Cortés in his letters to Emperor Charles V.[7] Mizquic was "a small town, completely set upon water," at a distance of "almost two cross-bow shots" from the shore; it had no walkways to the mainland. Cuitlahuac (described as "the best-looking small city we have seen") was placed in the center of the basin, thus commanding waterborne transport through the arterial canals along the east-west axis. It was linked to the shores of the mainland to the north and south by causeways that were part of a major land route to Iztapalapa and thence to Tenochtitlan. These causeways still stand. Xochimilco was close to the shore, on the outer side of a slough. Cortés alluded to "a broad causeway" and to bridges spanning "all the entrances to the city." These three towns are still standing on their old sites, and they have adjacent areas of chinampas. In addition, the ruins of Xicco rest on an apparently man-made platform abutting to an abrupt volcanic hill that formed a natural island in the eastern lobe of the basin. Xicco had been an important political center, and, according to native lore, was the mother city of the founders of Cuitlahuac.

Besides these island-towns, the watery landscape was dotted with small communities and dispersed farmsteads set on artificial foundations amid the chinampa plots.[8] Nowadays, the sites of ancient islet dwellings are marked by low platform mounds and heavy concentrations of crockery. Where the ground has been leveled by plowing, circumscribed deposits of potsherds, and, perchance, a scattering of foundation rocks or lumps of burnt adobe, reveal the ghosts of flattened house mounds (which may also be spotted as soil marks on aerial photographs taken at low altitudes). The fact that these sites are scattered over most of the former swamp zone facilitates the determination of the age of the surrounding chinampas—the vestiges can be associated with safely datable dwelling places. The samples of domestic pottery collected on the surface of 50 well-defined house sites were used to this end. The sampling units are broadly distributed within the swampy basin, and the ceramic assemblages are quite uniform in all of the units: the bulk of the material unequivocally dates occupancy to around A.D. 1500. Also, the time indicators show that the pattern of islet dwelling had spread during the span of a few lifetimes. The construction of these mounds was relatively recent: many of the ceramic lots include wares in vogue two or three centuries before the time of the Spanish conquest, but nothing definitely older was found in any of these sites.[9] Neither did excavation in the foundations of the man-made island of Cuitlahuac produce any indication of greater antiquity; as it stands, the limited evidence obtained in these test pits dates the earliest construction yet found there to the dawn of the Aztec period. All told (adding observations made all over the area in the course of the ground survey), the data conclusively show that the peak of chinampa expansion was attained during A.D. 1400 to 1600. The distribution plotted on the map (Fig. 2) represents the man-shaped landscape in Aztec times. In historical perspective, the evidence of the oldest ceramic

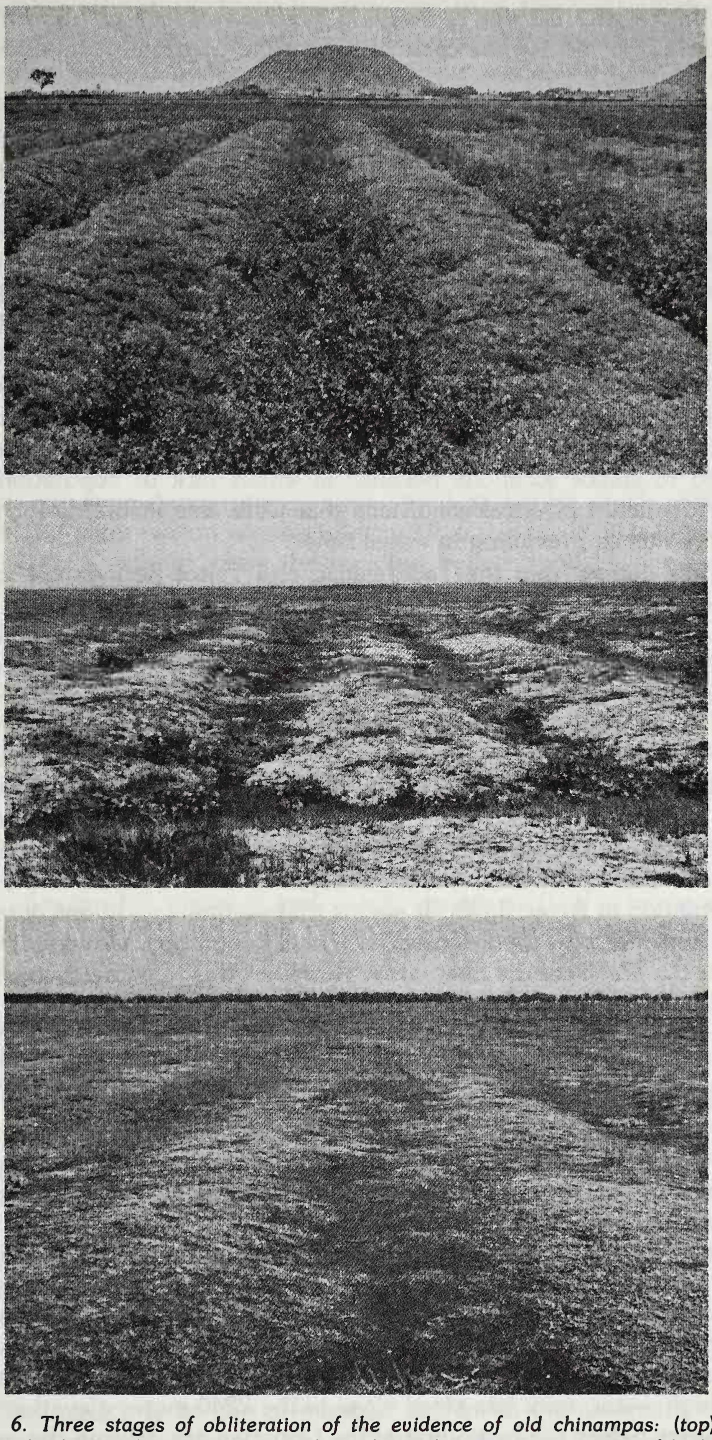

Figure 6. Three stages of obliteration of the evidence of old chinampas: (top) well-preserved ridges and plowed area, to the right, with parallel alignments of hydrophilic weeds; (middle) eroded ridges outlined by the vegetation growing on the intervening ditches; (bottom) leveled ground showing traces of chinampas, largely by means of soil contrast. In all of the pictures, the average width between the canal medians measures 4.8 meters.

components in samples from islet dwellings indicates that this pattern of dispersed settlement developed during the cycle of expansion initiated at the end of the Toltec period (13th century).

Nevertheless, settlement on man-made isles (presumably surrounded by chinampas) in the middle of the swamps had remote antecedents in this basin. This was conclusively established as the result of my 1970 testing at a site located in the bottoms to the southwest of Tlaltenco.[10] The site is made up of a fair-sized cluster of dwelling structures set on artificial foundations in what was then a shallow embayment of the lagoon. The excavation revealed that the construction of the isle antedated by several centuries the beginning of the Christian era and that its occupation came to an end before the onset of the Classic Teotihuacán period (about A.D. 1). More precise dating of this site must await processing of the information yielded by the stratitests. Another site within the lacustrine basin might prove to be ancient too, but it is still untested.[11] At any rate, the paucity of remains dating to pre-Classic times suggests that the early wave of expansion into swamps was restricted in scope, being limited to choice locations because of either lack of population pressure on resources or dominant physical conditions that were less favorable for the setting of chinampas than those prevailing in Aztec times.

Large sites dating from the Teotihuacán and Toltec periods are located on the shores of the mainland and on the island of Xicco; the townsfolk might have farmed nearby chinampas, although I do not yet have proof that they did so. However that may be, no time markers for these periods were found in indisputable association with vestiges of offshore settlement. In view of the evidence for an earlier beginning, it would seem that swamp reclamation receded to a minimum during the long interval from A.D. 1 to 1200; the most likely cause of the recession was hydrographic changes in the basin. I postulate that the water level rose, resulting in the spread and coalescence of standing ponds to form a large lagoon that completely filled the bottom of the basin. This would have restricted the setting for chinampas to the remaining marshland near the shore. Later on, the reversal of the trend led to the rapid expansion of reclamation in Aztec times. It seems that optimal conditions obtained through the 16th century, since it is documented that chinampa construction was going on decades after the arrival of the Spaniards. However, this hypothesis must be tested by further archaeological investigations and paleolimnological research.

The Setting for Raised Gardens

The relief of the bottom and the volume of standing water were the physical factors that controlled chinampa expansion in the Xochimilco-Chalco Basin.[12] The bottom of the basin is shaped like an exceedingly shallow saucer. This even-floored depression is confined by a ground rise that forms a low bank along most of the circuit; the break-of-slope approximately coincides with the 2240-meter contour line. Only the gentle slopes on the eastern shore and a limited fringe at the western end are susceptible to flooding by a moderate rise above this level. The rim of the high ground is studded with a score of towns and villages. These settlements have been tenanted since Aztec times or before; older sites too, long deserted, define this ancient shoreline. The persistence of location indicates that, except for disastrous flood stages, the high-water mark has stood close to the 2240-meter elevation since at least several centuries before the beginning of the Christian era. Within the ambit enclosed by the ground rise, the present elevation of the flats generally ranges between 2238 and 2239 meters, although the depths reach 2236 meters in the area of the old Lagoon of Ayotla (depicted in 18th- and 19th-century maps). Admittedly, these figures may be

at variance with past values. Floor levels might have been raised through silting (since, for the most part, the zone was under water until the end of the 19th century), but, on the other hand, this effect may have been compensated for by ground subsidence after the desiccation of the basin. Be that as it may, old maps and archaeological evidence indicate that changes in floor relief through the last 600 years have been of minor consequence.

The topographic data clearly show that a rise in water level above 2240 meters would flood the whole plain, forming a shallow lake some 180 to 200 square kilometers in size;[13] below that mark, large lagoons would be interspersed among tracts of swampland; a water level under 2238 meters would reduce the areas of standing water to a sizable lagoon (on the deeper ground to the southwest of Ayotla) and a number of scattered pools. This poses the question: What environmental conditions spurred chinampa expansion in Aztec times? With this in mind, the level of the normal high-water mark in the Aztec period (from the 14th to the 16th centuries) was tested through my 1968 excavations at Tlahuac (ancient Cuitlahuac). In the test pits that were dug to investigate the structure of the man-made island, construction floors and wall stumps dating from Aztec times[14] were found at depths which indicate that the lagoon level in the rainy season was less than 2238.8 meters (which is the level of the floor in the lowest dwelling) when the building began there.[15] The landfill for the foundations was piled on an evenly laid base of cut cattails that rested on a stratum of mud rich in vegetal matter—probably marsh sediment.[16] The cattail carpet is at 2238.4 meters; the ground level for later structures was progressively raised by the addition of landfill, so that the floor of the latest pre-Colonial building (in the excavated area) was laid at 2240.2 meters.[17] (Caveat: Although precisely determined by leveling from a bench mark on the mainland, the figures for elevations at the time of construction must be viewed as approximations, owing to the possibility that the old lake bed has subsided because of the recent depletion of the aquifers. However that may be, one can safely posit, on the basis of geomorphological considerations, that the extent of subsidence has been not more than 1 meter.) Correlating all these figures, and allowing for seasonal and yearly variations in the range of 0.8 to 1.4 meters,[18] it follows that the chinampas were built on what was swampy ground at the end of the dry seasons (although a number of large pools and extensive backwater areas, connected by a maze of sloughs, where undoubtedly permanent features of the natural landscape, even through the driest years). The correspondence between the distribution of chinampa ghosts and the extent of the swamps shows that the garden plot builders avoided the deeper waters.

Chinampas and Polity

Consideration of the formal features of the man-shaped landscape in the early 1500's suggests that the late pre-Columbian expansion of swamp reclamation over the Xochimilco-Chalco Basin reflects planned enterprise rather than spontaneous initiative. The comprehensive view of traces of old chinampas afforded by the aerial photomaps incontestably shows that the layout of plots was regulated by some overall scheme. Generally, the chinampas that can be dated to Aztec times were built in sets that were arrayed within the rectangular blocks delimited by the grid of service canals. Distances between the limited canals are not uniform everywhere, but they fit in patterns that indicate some sort of modular system in the allotment of space.[19] A series of parallel alignments of regularly spaced service canals can be traced from shore to shore all over the Xochimilco section of the basin and, in less extensive areas, within the Chalco lobe. From end to end, the pattern is definitely oriented along south-southwest to north-northeast axes.[20] On the basis of indicia observed at ground

level, I expect that aerial photography with infrared wavelengths (which has not been used yet to survey the basin) will reveal enough marks of the grid to fill the gaps between Mizquic and Xicco and between Xicco and Tlahuac. Whether the systematic allotment of space for chinampas within a frame of parallel axes followed earlier models, or whether the regulating plan represents an innovation fostered by the changes in political organization that occurred during the 15th century, has not yet been ascertained. It seems rather improbable, however, that a regular layout, extending without major discordances from end to end of the basin, could have resulted from community agreements to adjust the coalescent local systems. As I see it, the pattern of chinampa expansion in Aztec times betokens control at a higher political level.

Although the Valley of Mexico included other prime agricultural districts, none seems to have matched the productivity of the continuous zone of chinampa farming in the Xochimilco-Chalco Basin. The economic importance of the district, in the context of the Valley of Mexico as a whole, can be gauged with the help of a few figures. The gross area of reclaimed swamps, excluding islands, amounted to more than 120 square kilometers. Reducing this figure by one-fourth—to account for canals and an indeterminate number of interspersed pools—we are left with over 9000 hectares of productive soil built upon natural wastes. The yields of this farming system per unit of tilled land are extremely high;[21] according to empirically derived figures on the subsistence potential of chinampa horticulture, the zone may have produced enough food to nourish some 100,000 people. Certainly not all of the output was consumed locally; my data on plot sizes suggest that over one-half of the food raised on these gardens was available for distribution among nonfarming consumers. There is conclusive historical evidence that, through tribute and rent, and through the market system, the surpluses produced in this zone significantly contributed to the support of urban life at the empire's hub. The advantages of its location for the movement of produce to the centers of consumpton accrued to the importance of the zone; waterborne transportation, through the network of canals and expanses of open water, provided direct routes by boat from the places of production to the docks of the Aztec capital city Tenochtitlan and her annex Tlatelolco, the site of the central market.

In historical perspective, the creation of farmland over marshes and lagoons in the Valley of Mexico represents the ultimate development of its natural resources through aboriginal technology. The high productivity of chinampa horticulture considerably enlarged the basis of subsistence of the local population. This might have been the breakthrough that finally made this region a key economic area. Anyhow, the expansion of chinampa farming during the 14th and 15th centuries[22] appears to be related to a substantial increase in population. On the eve of the Spanish conquest, this heartland of empire greatly outranged in human resources any other center of power within the sphere of Mexican civilization (5, p. 268). Since the mid 1400's (when unity and stability were achieved under a confederal system that brought to an end a period of conflict between contending city-states), the rulers of the alliance controlled formidable reserves of manpower for engaging in military expansionist adventures, as they did. In this light, it can be said that the material foundations for Aztec imperialism were established by the farmers who had conquered the swamps.

—1971

References and Notes

1. Fr. J. de Torquemada, *Monarquía Indiana* (Madrid, 1723), book 13, chap. 32.
2. B. de Vargas Machuca, *Milicia y descripción de las Yndias* (Madrid, 1599).
3. *Relación breve y verdadera de algunas cosas de los muchas que sucedieron al Padre Alonzo Ponce en las provincias de la Neuva España* (Madrid, 1723), book 13, chap. 32.
4. Fr. H. Ojea, *Libro tercero de la historia religiosa de la Provincia de México de la Orden de Santo Domingo* (Mexico, 1897), p. 3.
5. P. Armillas, in *A History of Land Use in Arid Regions*, L. Dudley Stamp, Ed. (UNESCO, Paris, 1961), pp. 266-267.
6. See O. G. S. Crawford, *Archaeology in the Field* (Phoenix House, London, 1953), p. 51. Also, I am intellectually indebted to J. Bradford [*Ancient Landscapes* (Bell, London, 1957)] for many of the concepts expressed in my formulation. Studies in landscape archaeology are well advanced in several parts of the Old World; in the New World the approach has been pioneered by G. R. Willey [*Prehistoric Settlement Patterns in the Viru Valley, Peru* (Bureau of American Ethnology Bulletin No. 155, Smithsonian Institution, Washington, D.C., 1953)].
7. *Letters of Cortez: The Five Letters of Relation from Hernando Cortes to the Emperor, Charles V*, translated by F. A. MacNutt (Putnam, New York, 1908). The references to Mizquic and Cuitlahuac are found in the second letter, written in 1520. Xochimilco is mentioned in the third letter, written in 1522.
8. See Vargas Machuca (*2*): "A large number of Indians dwell inside the lagoon; they make staked enclosures and fill these with earth to some height above the water, and built their houses on top."
9. Plain kitchenware (including an exceedingly large number of earthen griddles, which attest to generous consumption of tortillas) constitutes the largest percentage of shards found in the debris. The bulk of the decorated dinnerware belongs to the so-called Aztec black-on-orange series. Of these, the fine line, geometric, "Tenochtitlan" type is present in all of the samples in a significant percentage. The chronologically overlapping "Tlatelolco" figurative style occurs in a majority of the lots, but it surpasses the frequency of the "Tenochtitlan" type only in some collection from large homesites that might have been principals' houses. The earlier, cursive, "Tenayuca" style appears in token or small amounts in about three out of four sites, and the still older "Culhuacan" bold line style is concentrated in locations close to the shore of Xicco Island (this type is rarely found in dispersed homesites). Other fineware associated with the Aztec black-on-orange include Aztec polychrome and Chalco polychrome, but the incidence of the latter is relatively small and spotty. Nothing definitely older than the black-on-orange series was found in any of these sites. On the other hand, a few Early Colonial glazed shards, a figurine, and a glass bead picked up in scattered places attest to the persistence after the Spanish conquest—probably until the beginning of the 17th century.
10. Site location: 14QMS972324 (Universal Transverse Mercator Grid); a range of flattop mounds rising about 2 meters above the surrounding plain. Test excavations at its eastern end exposed dwelling structures resting on a foundation of large rocks set on swampy bottoms. Upright pine logs (driven deep into the lake bed) reinforced in some spots the banks of this man-made island.
11. Site location 14QMS997292 (about 1 kilometer south of the edge of Tlahuac); a plowed bulge (about 80 meters in diameter) carpeted with potsherds similar to those found in site 14QMS972324.
12. Salinity, which limited the spread in Lake Tezecco, does not seem to be of consequence here.
13. A high stage began about 1600; it was caused by the blocking of the outlets that discharged into Lake Tezcoco—one of the many Early Colonial attempts to protect Mexico City from floods caused by the upsurging of that lake. The effects were disastrous for swamp farming; the rising waters submerged the chinampas and forced the lagoon dwellers to move out [see Torquemada (*1*)]. A rise above 2241 meters was detected in the test pits at Tlahuac; it flooded houses that were tenanted in the early 1500's and caused the collapse of the walls, leaving over the rubble a layer of silt that underlies deposits containing potsherds dated to the 17th century. This rise must have reached a temporary high mark at about 2243 meters, in view of the evidence (found by inspectors of the Dirección de Monumentos Coloniales) of a flood that laid silt deposits above the 16th-century foundations of the parish church (Architect Luis Ortiz Macedo, personal communication).
14. This is on the evidence of underlying fill containing shards of "Tenochtitlan" black-on-orange and associated wares.
15. The 1970 excavations at site 14QMS972324 showed that, some centuries B.C., the high-water mark stood perhaps somewhat higher than in Aztec times—but certainly below 2239.8 meters, since house floors were laid at this level.
16. Two wooden pegs, found imbedded in the landfill, appear to have strengthened this structure.
17. Several of the layers of landfill, found in the main testing pit under superimposed floors, contained only potsherds and terra-cotta figurines of the Middle Formative period (about 600 to 800 B.C.). Since these

deposits overlaid structures firmly dated at the 14th or the 15th centuries A.D., it is evident that the rubble used to raise the foundations was borrowed from an old abandoned site. A Middle Formative site located by J. R. Parsons (personal communication) at the village of Tlaltenco, on the mainland to the north, might have been the source of the rubble used in Aztec times to build up the island.

18. This is assumed on the basis of recent records of the control station at Xochimilco [see Comisión Hidrológica de la Cuenca del Valle de México (Secretaria de Recursos Hidráulicos, México, D.F., 1964), vol. 6, pp. 16 and 191]. A large number of historical documents, including pre-Hispanic annals, refer to broad-scale fluctuations of the level of the lakes—fluctuations large enough to drown chinampas, flood island settlements, and alter the hydrologic balance to the extent of reversing the flow between the interconnected lakes.
19. Around the nodes formed by the former islands of Cuitlahuac and Mizquic and, to a lesser extent, in the immediate vicinity of Xochimilco, this pattern was blurred by the radial cobweb of through-traffic canals that converged on these centers. This was most true around Mizquic, where the layout still conforms to a basically radial pattern. The lack of regular grid in the surroundings of these centers leads me to infer that the peri-island chinampas were built before the adoption of the regulating plan. However, some regular alignments of canal stretches can be traced across the mazes formed by the surviving chinampas at Xochimilco and at Tlahuac—which suggests that the present irregular layout may be partially the result of alterations that followed the breakdown of the system, probably after 1600.
20. Of course, visual alignment across 5 kilometers of flooded ground will seldom produce perfect parallels. Over most of the area, azimuthal deviations run from 18° to 26° clockwise from the astronomic north; the modal orientation stands close to 22°. However, to the north of Xochimilco the deviations vary between 12° and 18°; and, to the west of Xicco, the azimuths of a series of canals run 14° from the true north. Whether the orientation of the grid was dictated on the basis of cosmological notions, or whether it was adjusted to established traffic patterns determined by the natural drainage of the basin, is a matter of opinion. Certainly, the general aerial maps show that, in the central and eastern sections of the basin, the layout of feeder canals runs approximately perpendicular to the courses of the arterial transport routes, whereas at the western end it is deflected toward the old outlets to Lake Tezcoco.
21. W. T. Sanders, thesis, Harvard University (1957).
22. In addition to the swamps in the Xochimilco-Chalco Basin, smaller (but considerable) sections of Lake Tezcoco and the Lagoon of Xaltocan had been reclaimed for chinampa farming.
23. Field surveys 1965 to 1967 supported by NSF grant GS-890; test excavations (1968 and 1970), by grants-in-aid from the Wenner-Gren Foundation for Anthropological Research, Southern Illinois University (1965) and the University of Chicago (1966 and 1967) contributed research time. I gratefully acknowledge the support of Mexico's Instituto Nacional de Antropología e Historia; I thank J. L. Lorenzo, head of the Dirección de Prehistoria, for helpful advice, for the use of the department's laboratory facilities and equipment, and for the valuable assistance of members of the department's staff, R. Arana, T. Alvarez, and A. Flores, who, respectively, supervised the excavations, identified bones, and analyzed soils.

10

The Myth of the Milpa: Agricultural Expansion in the Maya Lowlands

by Norman Hammond

> The modern Maya method of raising maize is the same as it has been for the past three thousand years or more—a simple process of felling the forest, burning the dried trees and bush, of planting, and changing the location of the cornfields every few years. This is practically the system of agriculture practiced in the American wet tropics even today, and indeed is the only method available to a primitive people living in a heavily wooded, rocky, shallow-soiled country like that of the northern Yucatan Peninsula, where a plow cannot be used and where draft animals are not obtainable. This system is commonly known as *milpa* agriculture. . . . (Morley 1946:141)

Since Sylvanus G. Morley wrote these words more than three decades ago, the focus of Maya archaeology has expanded beyond the temples, tombs, and public buildings that, with epigraphy and calendrics, first absorbed most scholars. It now embraces rural settlement patterns, the relationships between settlement and resources, and the nature of these resources. Whereas we once looked merely at the pinnacles of achievement of Maya civilization, our view has dropped to comprehend the economic substructure upon which that dazzling edifice was raised.

The change began in earnest when Willey introduced systematic settlement archaeology into the Maya field (Willey *et al.* 1965). With the investigation of dispersed settlement far from the great ceremonial precincts and their surrounding zones of residence came an interest in daily life and the realities of obtaining one's daily bread. Morley himself (1946: 156-57) had noted the presence in the modern Maya diet of beans, squashes, root crops, and fruit, and the economic potential of breadnut, or ramon (*Brosimum alicastrum*). Others pursued each of these further as possible major constituents of the prehistoric diet (Bronson 1966; Puleston 1968a), in some cases overarguing the case for their chosen comestible like Portia advocating mercy.

Even so, the use of agricultural methods other than milpa swiddening and aboriculture, passive or active, was not consciously considered until quite recently. Although the existence of raised-field complexes in other regions of the pre-Columbian Americas had been emphasized (Denevan 1970; Parsons and Denevan 1967), they remained unnoticed in the Maya area until the work of Siemens and Puleston (1972). New areas of such fields are still being discovered even in relatively well explored parts of the Maya lowlands; the debate about their precise function, economic contribution, and chronological position continues unabated, in this volume *inter alia*. Similarly, the use of terracing to create artificial fields in marginal econiches, although noted by J. Eric S. Thompson (1931) and by A. C. S. Wright *et al.* (1959), was not brought into the forefront of Mayanists' attention until the work of B. L. Turner II (1974a). Our awareness of the range of agricultural options open to the ancient Maya has greatly increased since the time when Eric Thompson (1954: 234) could say, quite accurately on the basis of information then available, "Maize was . . . the economic basis of Maya civilization" and envision no other means than the milpa for acquiring it. We recognize now that other foodstuffs, and other ways of growing them and maize as well, were important, and that the Maya economy was far more complex than archaeologists had imagined.

In this paper I outline some of the ways in which agricultural production could have been expanded in the Maya lowlands. I draw a fine distinction between *expansion* and *intensification* in genuflection to the editors of this volume and the uniform terminology that they wisely impose upon their contributors.* *Intensification* I use in their sense of the frequency with which a particular plot of land is cultivated, measured by the crop-fallow cycle or the percentage of the time that the land is in crop. In an earlier paper (Hammond 1976a) I used this term as I now use *expansion*, to describe agricultural activities that absorbed a larger proportion of the total labor-time available in a society. With the word used in that way, an increase in acreage under cultivation, involving both an absolute increase in man-hours worked and, in many cases, a higher proportion of the total work-hours available, would be a form of intensification. Here, however, such an increase is treated as a form of expansion. I suggest that certain forms of expansion may, in conditions of adequate but not excessive ("critical") population density, actually be preferable in terms of labor economy to the milpa system, which we have assumed to be the ideal under conditions of low population pressure, and that such conscious decisions may have been taken at least as far back as the later Early Formative, *ca.* 1400 B.C. (calibrated ^{14}C years).

Expansion of agricultural production may be spatial, temporal, specific, or more than one of these. Spatial expansion may be lateral, vertical, or both.

Lateral Expansion

At its simplest, lateral expansion is merely an extension of the area of land under cultivation at any one time. Under the present and historically attested regime known as milpa, extensive swiddening on a crop-fallow ratio of 1:3 or greater, this would be carried out by clearing more high bush (climax or long-term regenerate forest) each year, or by beginning the recycling of shorter-term second-growth *wamil* areas at an earlier date (producing temporal compression, a form of increased activity midway between expansion and intensification).

In the first instance the degree of expansion would be limited by (1) the proximity of other communities practicing swiddening, and perhaps expanding simultaneously, and (2) the maximum socially acceptable journey-to-work time, estimated by Michael Chisholm (1968) to be up to five kilometers, although Ruben Reina (1967) demon-

*Refers to the volume in which this paper first appeared, not the present volume.—*J.A.G.*

strates that greater distances are traveled in the modern special case of communities bordering Lake Peten-Itza, where motor-driven canoes are used. In any case, the creation of too great a distance to work would result in the growth of subsidiary communities that would then act as a limitation because of their proximity, as in condition 1. Lateral expansion as such—that is, input of an increased proportion of the total labor-time available into a larger surface area cultivated by the same methods and with the same yield per unit area—is thus constrained both statically and dynamically. Demand for an absolute increase in output may be governed not only by population increase (in which case the labor-time available also increases, after several years' lag) but also by rising expectations in an evolving society with increasing social differentiation, such as that of the Formative and Classic Maya. In either case constraints operate; as more land is required, less is available.

A second type of lateral expansion is the utilization of previously uncultivated soil sets. It is a truism, the ramifications of which have not been sufficiently appreciated in Maya studies, that the most productive soils for a given economic situation will be exploited first, and that exploitation of successfully less productive soils will follow as necessary thereafter. Given the complex soil pattern of even so topographically uniform a landscape as northern Belize, consisting of low limestone ridges with a maximum elevation of 25 meters (Wright *et al.* 1959), certain patches of land are today preferred for what may be a marginal advantage, degree of acidity; if necessary, however, the less attractive soils will be exploited. Another example of this preference may be seen in southern Belize, around the Classic Maya site of Lubaantun, where present cultivation extends in a band along the eastern slope of the hills, between 25 and 100 meters in elevation. This land is not only as fertile as more elevated slopes, but it is also nearer to the riverside settlements and so minimizes journey-to-work time (Hammond 1975: Fig. 40).

Vertical Expansion

In the course of lateral expansion across the landscape, cultivation may be extended into higher or lower econiches than those initially exploited or than those utilized when demand is low. In the Maya lowlands this means the use of steep hill soils or those in seasonally or permanently waterlogged valley bottoms. Hill soils are avoided normally not only because of their thinness and susceptibility to erosion, but because of their greater distance from settlements and water, and thus the increased journey-to-work time that their exploitation entails. When steep hill soils must be used, various devices may be employed to restrict erosion, to trap the eroded soil, and to create areas of more level land. These devices, known generically as "terracing," have been most recently described for the Maya lowlands by B. L. Turner (1974a; 1976b).

Terracing often occurs on land higher and steeper than the slopes normally used for swiddening. It involves the construction of stone walls, often of some bulk, by a work force presumably cooperative, in the sense that each terrace would have been built by more men than would subsequently have been needed to cultivate the land it created. Whether cooperation was voluntary or coerced by secular or numinous sanctions cannot be inferred from the immediate archaeological evidence.

Similar corporate activity may be detected in the extension of cultivation into waterlogged bottomlands, where *bajo*, or marginal river-valley swamp, is converted into drained land by the construction of raised (ridged) fields. These have been the subject of much recent study and discussion, notably on the Candelaria River in the western lowlands (Siemans and Puleston 1972; J. E. S. Thompson 1974), in southern

Quintana Roo (Harrison 1977), around Tikal (Harrison 1977; Dahlin 1976a), and in northern Belize (Hammond 1974b: 188-89, 1975; Puleston 1977). They consist of drainage canals, dug in parallel or grid formation a few meters apart, the upcast from which is piled between canals to create an area of terrain raised above the water table; the similarity to chinampas is close.

Periodic cleaning of the canals and the casting up of muck onto the raised fields increases their elevation and counters erosion; the upcast organic detritus (vegetable matter, fish feces, defunct water creatures, and so forth) from the bottom ooze renews fertility. The canals themselves provide easy access to the fields for cultivation and the removal of produce by canoe, and also act as fish refuges; they may even be intentionally operated as fish hatcheries (J. E. S. Thompson 1974). Bruce Dahlin (personal communication) has pointed out the symbiotic relationship that would exist if, as he suggests, cacao was being grown on the fields, with the midges that pollinate cacao breeding in the canals, their eggs forming a source of fish food, and the resultant fish feces a mulch for the cacao trees.

Whether cacao was cropped in this artificial econiche is a matter of debate, but the conditions would be conducive to it in raised fields in general (Wright *et al*. 1959; Thorold 1972), and in particular in the studied case of the Rio Hondo and Rio Nuevo raised field complexes around such sites as Nohmul and San Estevan in northern Belize (Hammond 1974b; Dahlin 1976a). Puleston (1977) is of the opinion that maize rather than cacao was cropped, citing the presence of maize pollen and the absence of cacao pollen in cores taken from the beds of interfield canals. Although maize may have been one of the crops, we might note that the fields are immediately adjacent (less than 50 meters in some cases) to the limestone ridge terrain currently used for maize swiddening, and that pollen could easily have been transported this distance by wind or rainfall runoff. The absence of cacao pollen is similarly not a conclusive argument, since ''cacao does not shed pollen and its survival in canal silts is extremely unlikely'' (Thorold: personal communication). In other words, even if cacao was grown on the raised fields, it would leave no palynological evidence, so one cannot argue *ex silentio* for its noncultivation; the point is therefore moot according to the botanical evidence. Other evidence, however, may be taken into account. The limestone ridges are not (in northern Belize at least) the most suitable terrain for cacao, which needs constant water at the roots, and the region's reputation as a cacao-producing area at the time of the conquest (Roys 1931:52) cannot easily be equated with inland cultivation. The planned investigation of one of the best-preserved raised-field complexes within the purlieus of the major site of Nohmul, lying just off the ridge and with the canals still open and water-filled even in the dry season, should provide us with more evidence, though not necessarily more certainty, in the dispute.

Vertical expansion thus raises a number of questions—about construction logistics and about the motives for expansion and cooperative construction—that have important implications for the degree of organization of Maya society at the time when the terrace and raised-field facilities were constructed. I shall return to this subject below.

Temporal Expansion

This mode, which is more closely related than lateral or vertical expansion to the definition of *intensification* used in this book, involves an increase in the number of person-hours devoted to each unit area of cultivated land. In lateral expansion the absolute number of hours will rise, as will the proportion of the total work-time available in the community; in the temporal mode of expansion they are focused on a

constant rather than an enlarging area of land. This focusing can take two forms—simultaneous and extended temporal expansion.

Simultaneous expansion involves the labor of more people at the same time, carrying out any task more quickly or allowing it, as with weeding, to be carried out more often. It is one way of raising yield per unit area by removing crop competitors more efficiently. *Extended temporal expansion* is the cultivation of the same area for longer—fitting in an extra crop or using the plot for an extra year. The increase in weed growth with successive years in swiddening probably means that extended temporal expansion will mean increasing simultaneous labor input also, so the two forms are to some extent interdependent.

Temporal expansion may or may not covary with a decreased fallow period, but the total area of land required by a community of any given size will clearly decrease with the degree of temporal expansion. Since land closest to the settlement would be worked first, the decrease in area would also result in decreased journey-to-work time, and an effective increase in the working day. The increased labor input may be more cost effective than extensive swiddening even without the stimulus of pressure on resources, provided that the critical mass of labor necessary to operate such a system is available and controlled.

A variant form of temporal expansion is multi-cropping in a single year. Here the additional person-hours might have been devoted to only a slight increase in the amount of weeding, since fewer weeds would have had time to develop between crops. Moreover, the crop return per person-hour invested would rise because a higher proportion of the time was being devoted directly to cultivation rather than to ancillary occupations such as clearing land. On the other hand the direct process of cultivation might be considered to include mulching plus the time needed to collect and transport mulch material. The observation by several workers (*e.g.*, Culbert, Magers, and Spencer) of multi-cropping in southern Peten, Guatemala, on soils not notably more fertile than those of much of the rest of the Maya lowlands, suggests that even with usual swiddening methods, let alone the more highly organized creation of artifical econiches involved in terracing and raised fields, we may have substantially underestimated carrying capacity by overlooking this form of temporal expansion.

Specific Expansion

This involves an increase in the number, variety, and productivity of crops exploited. While it remains largely unchallenged that maize, beans, and root crops such as camote and yuca (cassava) bulked largest in Maya agriculture and diet, a case for the exploitation of tree crops, especially ramon, has been made by Puleston (1968a), who has also shown that chultunes can be used for the storage of ramon nuts. Although I accept Puleston's data on the nutritional value and yield of ramon trees, I feel that the reputation of ramon nuts as a famine food among the Postclassic and historic Maya indicates that it was not a preferred food for humans. The stands of ramon trees around Maya ruins first remarked by Lundell (1937) are more likely to be the result of selective culling—that is, of not cutting down a potentially useful tree—than of intentional arboriculture. Nevertheless, when the overall nutrition of the Classic Maya began to deteriorate (Saul 1972) while the number, size, and density of settlements increased, and when competition ensued, erupting into warfare (Hammond 1974a; Webster 1976), then the ramon, despised but not ignored, may have provided an invaluable supplement to stretch the Maya diet and extend the collapse into a long drawn-out agony rather than a quick cultural death.

The ethnobotanic knowledge of the historic Maya (Roys 1931) indicates that the pre-Hispanic Maya could use a large number of uncultivated plants and trees for subsistence. Expanded resource procurement could thus presumably occur simply by increasing the number of person-hours spent in collecting; the only limits would be the maximum economic distance, the presence of others' territories, and the rate of reproduction of the species utilized. Such expansion would be archaeologically impossible to detect in the usual Maya lowland contexts, since no special equipment would be necessary for collection, processing, or consumption besides that already utilized for cultivated plants; a wooden mortar and stone metate and mano would suffice for all. The difference in carrying capacity generated by minimum, optimal, and maximal exploitation of such resources might well exceed differences caused by many more formal and archaeologically detectable modes of expansion or intensification.

Even in formal cultivation plots, whether swidden clearings or constructed terraces and raised fields, more than one species can be grown simultaneously. Many species can be cultivated at once within a complex schedule based on the varying maturation rates of different crops.

The symbiosis of maize and beans, the latter twining up the stalks of the former, is a natural (Flannery 1973: 291) as well as an agricultural commonplace, as is the growth of squash species on the ground surface between the corn plants. Root crops can be grown below ground in a field occupied by another crop without a commensurate increase in horizontal area, and useful trees such as the cohune palm or copal and ritually important ones such as the yaxche are even now left standing in swidden plots. Some root crops, such as cassava, continue to be cultivated after corn production in the same field has ceased. The variety of plants that can be productively juxtaposed within a small space has been well illustrated by Robert Netting (1977) from African and Mesoamerican ethnographic evidence. Netting has also emphasized the subsistence importance of dooryard gardens, where the fertility of the soil is enhanced by mulching with household refuse and the feces of both human and animal inhabitants.

In studying the Classic Maya settlement around the Lubaantun ceremonial center I estimated the area of a *plazuela* house-compound at twenty-five hundred square meters, ample to support the trees required by the household and still leave space for intensively fertilized garden plots (Hammond 1975: 91-93). For ventilation, light, drainage, and defense, the *plazuelas* occupied the tops of knolls, so, because of the thin soil and degree of erosion, the sites were not desirable for swidden. The perimeter wall of the basal platform of the house compound not only created a level surface for habitation, but also acted as a terrace and silt trap to retain soil on the top of the knoll. Thus a marginal econiche was rendered useful in several ways. The artificial environment of the *plazuela* platform should perhaps be regarded as a special case of intensive cultivation, with emphasis on nonstaple crops.

Not only can the quantity of crops grown be increased, but also their quality. A. V. Kirkby (1973: Fig. 48a, b) has shown how mean corncob length has increased through time from 5000 B.C. to the present in highland Mexico, and how yield per hectare has simultaneously increased at an even greater rate (perhaps because cob diameter and thus seed-bearing surface increases as well as length). Whether this increase in size was a conscious development, the result of deliberate seed selection, or the result of a random but beneficial process, we cannot know. At present there is no evidence from the Maya lowlands to parallel that from Mexico, although the preservation of carbonized plant material at the Early Formative through Late Classic

site of Cuello in Belize gives some cause for hope. From data such as Kirkby's, increases in unit-area productivity under different temporal regimes can be calculated to give a band of carrying capacities attainable at different periods, based solely on cultivars that survive archaeologically. Root crops present a problem; not only do they survive less well than seeds, even in well-preserved deposits, but they are less likely to be recognized in excavation and more susceptible to damage by wet- or dry-sieve recovery methods. Furthermore plants reproducing vegetatively may reproduce at a different rate from those cultivated by cloning.

Although I have described each of these possible modes of agricultural expansion—spatial, temporal, and specific—separately, it is clear that they could operate in concert and with mutually reinforcing effect. Both spatial and specific expansion demand a greater absolute and probably relative investment of time for the construction of terrace walls, digging of canals, clearing of larger areas for swidden, cropping the same area more often, weeding it over a longer period, and planting more species in the same plot. Time is available as a direct function of population level and density, given a constant age and sex composition. The more people present within a specified area at a given moment, the more work-time is potentially available. Since more people equals greater consumption, a prudent community will satisfy demand with the least possible expenditure of energy in order not to increase demand by the effort involved in satisfying it.

The present swidden regime exactly fulfills this necessity, producing maximum return for minimum effort, in the given context of low population density. The land utilized is that best suited to swidden—sloping, well-drained limestone soils—given a level of demand that permits a low-fallow cycle. Steep hill soils and *bajo* are not utilized because the present population is neither dense nor organized enough to construct and maintain the artificial econiches that would be needed. That these soils *could* be used productively seems unquestionable.

Archaeologists have tended to extrapolate back from the ethnographic and historic milpa regime into the Classic period, although they are well aware of the demographic and cultural differences between the Classic and the present situation. Studies of agricultural intensification have been implicitly based on the notion that terracing, the use of raised fields, multi-cropping, and other ways of getting more feed out of the same area of land were innovations that supplemented an existing swidden system by utilizing hitherto marginal terrain or increasing the efficiency of the swidden cycle itself.

What we have not considered to date is the possibility that the artificial environments of silt-trap terraces and perennially productive raised fields may have been created deliberately, under no compulsion of population pressure, as a conscious maximization of resources. By making a small area close to the settlement extremely productive, it would be possible to avoid long journey-to-work times; the extra effort involved in the construction of the artificial econiche would be largely or entirely offset by the time thus saved. This effort might only be feasible with a certain degree of cooperative labor, however—one obtainable only from a population more densely clustered and more socially organized than the Postclassic and historic inhabitants of the central and southern Maya lowlands. Given this critical mass of population size, density, and organization, none of which need have been close to the maximal levels of the Classic period, it may have been a sounder investment of labor to create and maintain a highly productive and easily protected econiche close to the settlement than to engage in extensive swiddening at some distance, with the onerous clearing of

new or second growth each year. The institution of swiddening could then be seen as a response to increasing population pressure, with new and less labor-efficient means of production becoming necessary as demand increased, but as the labor supply increased also.

The initial pattern of penetration of the central and southern Maya lowlands seems likely to have been riverine, exploiting the greater variety of resources in and adjacent to the stream, its banks, and marginal swamps. In this situation the raised-field econiche in the swamp margins could have been created early in the Formative. In the Early Formative (2500-1300 B.C., calibrated ^{14}C dates) both architecture and trade goods (including metates from 150 kilometers away and jade from 400) attest a society of some degree of organization and sophistication at the Cuello site in northern Belize. A radiocarbon date of 1110 ± 230 B.C., calibrating to 1400 B.C., for a post from the bank of a raised-field canal in the region indicates that such an artificial environment was already in use by the end of the Early Formative (Puleston 1977). The mollusc evidence from Cuello indicates intensive exploitation of swamp-dwelling species through the Early Formative, but an absence of species characteristic of cleared and burnt-over land. The latter appear in the Middle Formative, suggesting the introduction of swiddening (L. Feldman, personal communication). It would therefore accord with the present evidence, sparse though it is, to suggest an initial phase of intensive exploitation of riverine and swamp resources, including the construction and cultivation of raised fields for subsistence crops, followed, as population increased, by the exploitation of the limestone ridge for swiddening. The decline of swamp Mollusca in the Middle Formative may be due to the draining of their habitat for raised fields; a more precise tabulation of their occurrence in occupation and midden deposits through the long Early Formative may help to document the beginning of drainage activity.

There is as yet no evidence of the use of terracing in the Formative. This form of artificial environment, occurring not in the river valleys but on hillsides, may have been introduced after swiddening as the result of still-increasing demand. (This speculation is independent from that suggesting the use of raised fields as an early, deliberately chosen means of agricultural production.) What seems certain, in these hypotheses and others, is that the myth of the milpa is moribund; we may not, and do not, any longer think of swiddening on the ethnographic and historical model as the sole support of Classic Maya society and civilization.

—1978

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11

The Earliest Lowland Maya? Definition of the Swasey Phase

by Norman Hammond, Duncan Pring, Richard Wilk
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Elizabeth S. Wing, Arlene V. Miller, and Lawrence H. Feldman

Until recently, the period defined as the Early Formative (notionally 900-1500 B.C.) was unknown in the Maya Lowlands, the region comprising the Yucatan Peninsula of Mexico and the tropical forest zone of Belize, northern Guatemala, and the lowland areas of Chiapas and Tabasco. Even though Olmec civilization had emerged in the second half of the second millennium B.C. along the Gulf Coast to the west (Coe 1970), no occupation of the Maya Lowlands was known prior to 900 B.C. (Berger *et al.* 1974). In this lack of an Early Formative tradition the area was an anomaly in Mesoamerica, particularly among regions which subsequently developed complex societies.

Recent field survey and excavation in northern Belize, on the eastern margin of the rainforest zone of the Maya Lowlands, have now yielded both ceramic and radiocarbon sequences which document a long Early Formative development, dating back to at least 2500 B.C. in calendar (calibrated) years (Hammond, Pring *et al.* 1976). This Early Formative has been designated the Swasey phase, and in this article we outline the salient characteristics of the ceramic and lithic complexes, architecture, funerary practices, and the human population and its supportive economy and external contacts within the framework of the radiocarbon chronology. Dates are given using the British convention of b.c. for radiocarbon dates and B.C. for dates calibrated using the bristlecone pine curve. The calibration used here is that of Clark (1975).

Chronology

The Swasey phase is dated formally to 2000-1000 b.c. in radiocarbon years, 2500-1300 B.C. in calendar years rounded to the nearest century. This assigned time

span is based on a suite of 12 radiocarbon dates on samples recovered from stratified deposits at the site of Cuello, Belize; these samples were associated with Swasey complex ceramics, burials, and architecture. The dates (Fig. 1) span the successive construction phases O-IV at the site, as established in the 1976 excavations (Donaghey *et al*. 1976). This stratigraphic succession of architectural events provides a check on the radiocarbon date sequence, which indicates that 10 of the 12 dates have a coincident chronological and stratigraphic order, while the reversal of the remaining two dates lies within one standard deviation of the date that would be expected were the coincidence perfect. The earliest date in the suite is 2050 ± 155 b.c. (UCLA-1985e): the earliest date in terms of stratigraphic position is 1950 ± 65 b.c. (Q-1571). The latest dates are 1050 ± 160 b.c. and 1020 ± 160 b.c. (UCLA-1985a and Q-1476).

The internal consistency of the suite is reinforced by the agreement between the two dating laboratories, at Cambridge University (Q) and the University of California, Los Angeles (UCLA), which have dated both stratigraphically adjacent and divided single samples from Cuello with agreement within one standard deviation. The same laboratories have dated samples with Middle and Late Formative associations from Cuello, and from other Maya Lowland sites: the Cuello dates accord both with the established Maya Lowland sequence and with the stratigraphic succession at the site. Laboratory bias cannot be seen as an explanation for either the early dating or the long persistence of the Swasey phase. Routine measurement of the C-13/C-12 ratio indicates that all samples were of normal carbonized wood, unmineralized, so that a misleading antiquity due to absorption of mineral carbon cannot be put forward as an explanation either. We, and our colleagues in the radiocarbon dating laboratories, conclude that the radiocarbon dates obtained on the samples are likely, within the usual range of statistical uncertainty, to be the true age of the samples in question when exchange with the carbon reservoir ceased.

The radiocarbon dates obtained from the 1975 and 1976 excavations, Operations 17B and 17F, at the Cuello site (approximately 18°05′N 88°35′W) are displayed in Figure 1, in stratigraphic sequence correlated with construction phases O-IX and major Formative and Classic cultural periods as indicated by associated ceramics. Dates for the Middle and Late Formative are displayed together with those for the Early Formative Swasey phase to emphasize the internal consistency and stratigraphic correlation of the suite of dates. Where a number of dates are stratigraphically equivalent, as in construction phase II where the dates UCLA-2102d, Q-1573, Q-1576, and Q-1577 all appertain to burnt structural members of the same building, they are ranged with the oldest to the left. Each date is shown with the range of 1 and 2 standard deviations, and a high degree of statistical uniformity for dates within any one construction phase is observable and not unexpected. The precise stratigraphic relationships between sample contexts can be determined from the Harris matrix (Fig. 2) and the section (Fig. 3; both from Donaghey *et al*. 1976).

One further Swasey phase date is available from the Cuello site, from another trench (Operation 17C, layer 37) not correlated stratigraphically with Operations 17B and 17F, and therefore omitted from Figures 1 and 2. This date, 1230 ± 195 b.c. (UCLA-1985g), is from an occupation horizon sealing a bedrock grave containing a burial with five Swasey complex vessels. That occupation during this period was not confined to the Cuello site is suggested by a date of 1250 ± 205 b.c. (Q-1575) for a basal layer at Barton Ramie in the Belize Valley, with associated ceramics of the Early facet of the Jenney Creek ceramic complex (Willey *et al*. 1965; Gifford 1976). Modal similarities between late Swasey and early Jenney Creek ceramics suggest that this

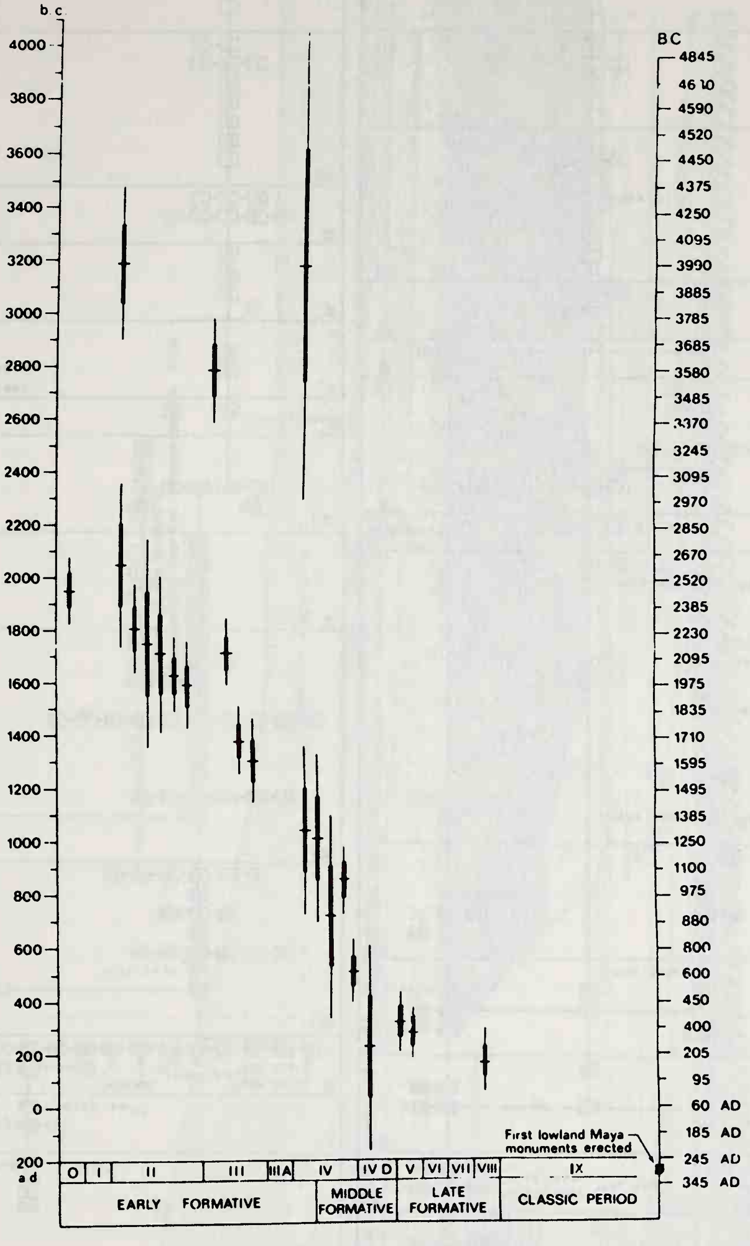

Figure 1. Radiocarbon dates for the Formative sequence at the Cuello site, Belize. The thick bar represents 1 standard deviation, the thinner extension 2 standard deviations. Construction phases O-IX are independent of, and act as a control on, the radiocarbon chronology. Dates are ranged in stratigraphic order, the earliest at left. Full date ranges on 1 and 2 standard deviations and calibrated ranges are in Hammond, Pring et al. 1976; Hammond, Donaghey et al. 1977. Laboratory numbers for the dates in Figure 1 are, from left: upper tier: UCLA-2102c, b, g; lower tier: Q-1571; UCLA-1985e; Q-1572; UCLA-2102d; Q-1576; Q-1573; Q-1577; Q-1574; Q-1578; Q-1979; UCLA-1985a; Q-1476; Q-1559; Q-1580; UCLA-2102a; UCLA-2102h; UCLA-2102f; Q-1581; Q-1558.

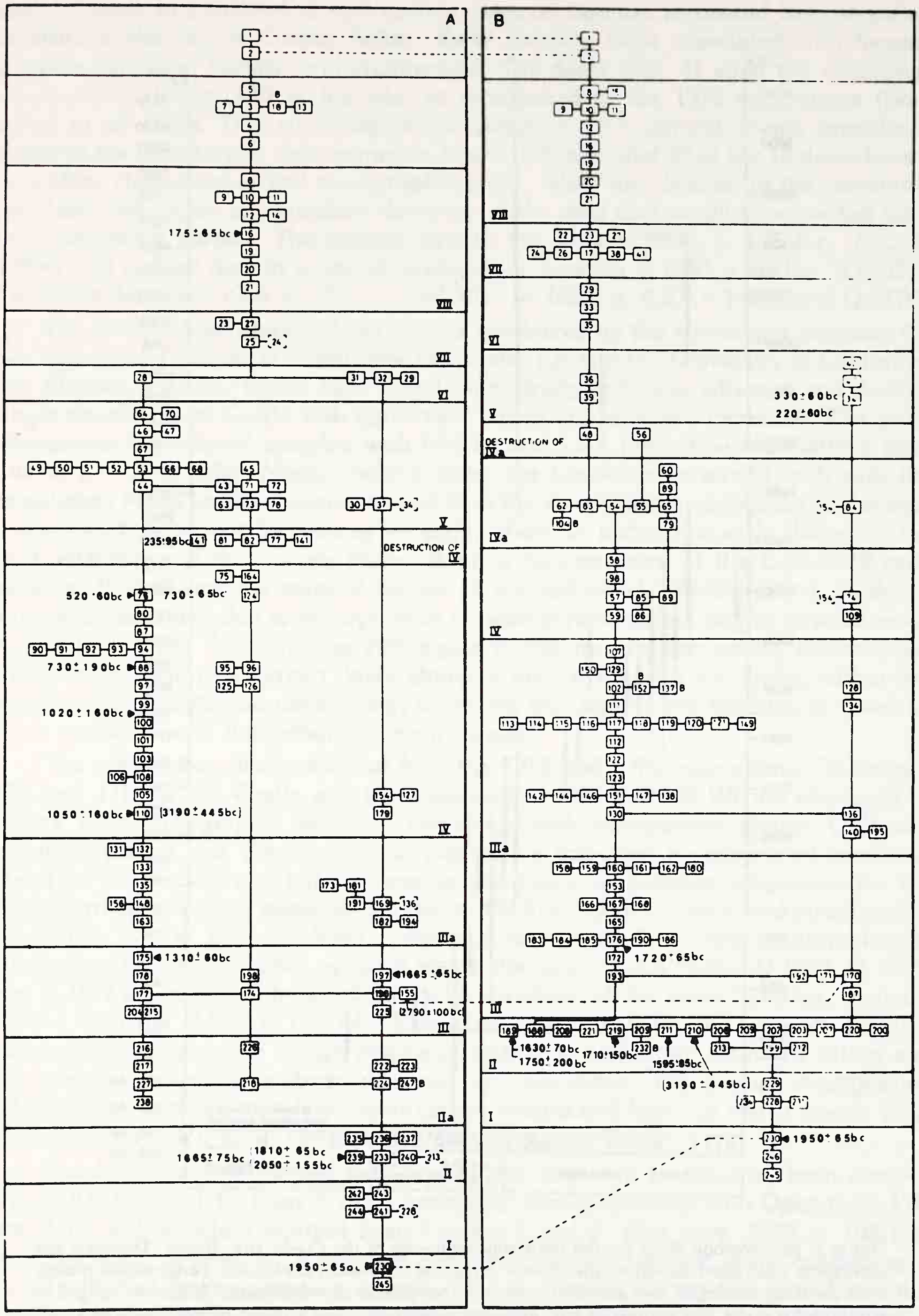

Figure 2. Harris matrix depicting the stratigraphic relationships between contexts in Squares A and B of Operation 17F at Cuello (Square A incorporates Operation 17B and dates have been transferred to the renumbered contexts). The construction phases O-IX have been superimposed on the sequence, and the radiocarbon dates added. Dotted lines indicate some stratigraphic continuities between A and B.

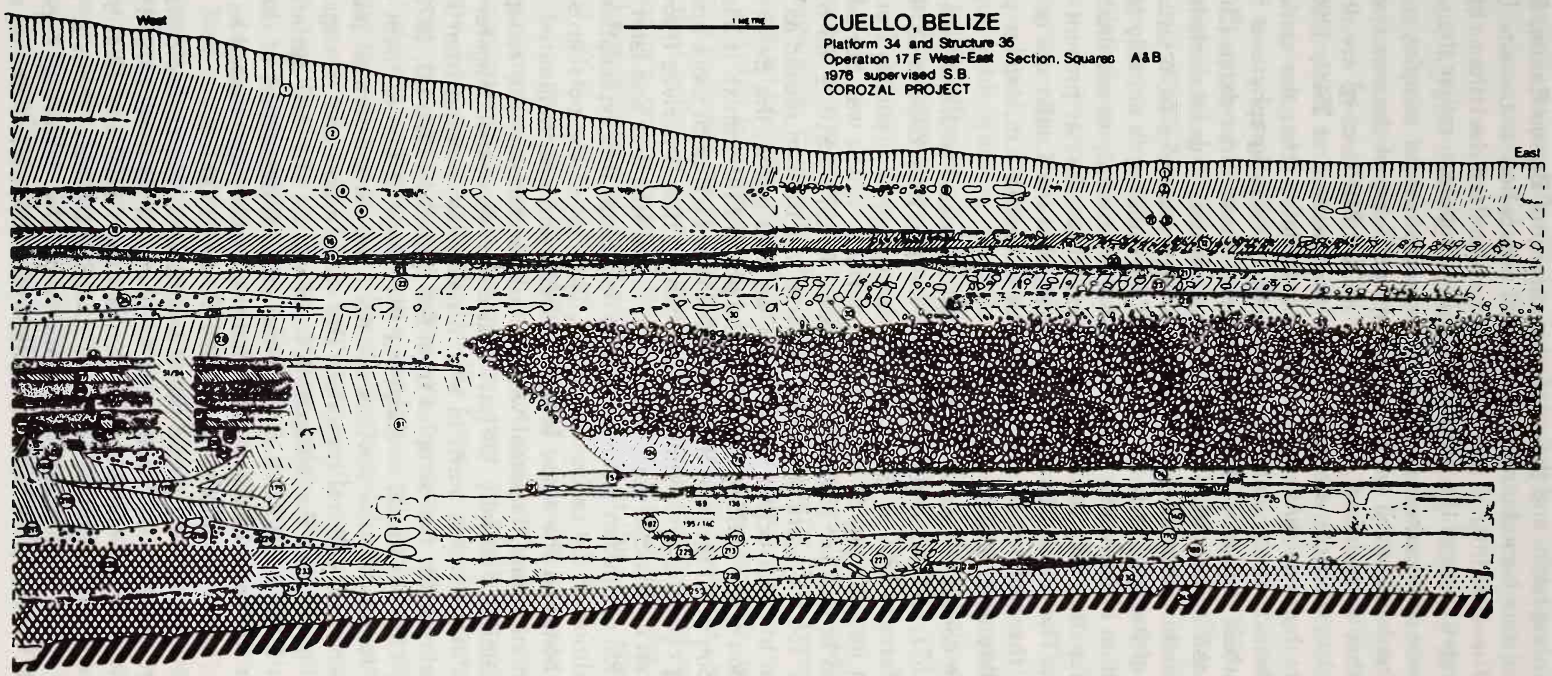

Figure 3. West-east section of the north profile of Square A and the south profile of Square B in Operation 17F at Cuello. Early Formative levels extend approximately up to layer 100 at left and the floor layer 169 at right; the layer of rubble fill over the patio floors extending across the right-hand two-thirds of the section marks the beginning of Late Formative construction. Drawing by Sheena Howarth.

date is acceptable, and the original excavator of Barton Ramie, Gordon R. Willey, has accepted this back-dating of the initial occupation at the site (personal communication). These additional dates have large standard deviations, but their central dates and ranges support the proposed Cuello chronology rather than otherwise.

Three radiocarbon dates have been obtained for samples recovered from Swasey phase contexts which we do not accept as being of the same age as the contexts in which they were found. These dates (UCLA-2102b, c, g) are displayed at the top of Figure 1 in their correct stratigraphic relationship: at 2800, 3200, and 3200 b.c. they antedate by a millennium or more other dates from the same or stratigraphically equivalent contexts which correlate with the stratigraphy and the overall Formative radiocarbon sequence for the site. One of these three dates (UCLA-2102g) is from a fill deposit and could plausibly be on a sample of wood anciently burnt, whether by man or nature, but the other two dates are on samples from structural contexts. Since timber of the species likely to be used for building is unlikely to have survived for a millennium unburnt in a tropical forest environment, we are unable to advance this as an explanation and regretfully must conclude that at present we cannot offer any solution. The possibility exists, of course, that the Cuello site or its vicinity was occupied in the early third and late fourth millennia b.c., but at present we lack both probability and proof.

The earliest dates which we accept as coeval with the Swasey phase occupation are Q-1571, Q-1572, and UCLA-1985e, ranging from 2050 to 1810 b.c. Sample Q-1571, which dates to 1950 ± 65 b.c., is on charred small branches from an occupation layer trodden into the top of the old land surface, which was buried by subsequent construction at Cuello. The other two dates, Q-1572 (1810 ± 85 b.c.) and UCLA-1985e (2050 ± 155 b.c.), are on similar material in a midden reused as the fill of a plastered platform in construction phase II; as we note below, the dates apply to the original deposition of the midden and not to the present fill context. It has been suggested that the carbon in all three of these samples is in fact much more ancient than the accompanying ceramics and other cultural debris, that it derives from either natural bush fires or an undetected early occupation in the area and was later incorporated into the occupation or midden deposits. We do not accept this explanation for several reasons: the condition of the carbonized wood, like that of the potsherds, mollusc shells, and animal bones in the same layers, is fresh and uncomminuted, with no sign of the fragmentation and dispersal which would accompany the redeposition of long-scattered material. Secondly, we have four definitely coeval dates for construction phase II on structural timbers burnt in situ in postholes, ranging from 1750 to 1600 b.c. The mean date for the two samples from the reused-midden fill, 1870 ± 70 b.c., is sufficiently close to these, overlapping the range of two of them on one standard deviation, to suggest the obvious solution: the carbon formed part of a trash deposit coeval with the cultural material. The radiocarbon and stratigraphic evidence combined suggest that the occupation layer on the old land surface began to build up between 2000 and 1900 b.c., that the original deposition of the midden took place between 1900 and 1800 b.c., and that the midden was reused as fill for the low, construction phase II platform between 1700 and 1600 b.c.

The later Swasey phase dates accord with this chronological placement of construction phases O-II. Three dates for phase III (Q-1574, 1578, 1579), two from structural contexts and one from fill, run between 1700 and 1300 b.c. The two Swasey-associated dates for phase IV are of 1050 and 1020 b.c. (both ± 160 years), the latter from a burial with vessels transitional to the following Lopez Mamom ceramic complex. Finally, if we were to disallow all radiocarbon dates on samples from fill and

occupation surface contexts, we would still retain a chronology on structural timbers running back to 1750 b.c. and correlated with the stratigraphic succession at the site, with two undated earlier construction phases.

We must, therefore, suggest that the radiocarbon chronology displayed in Figure 1 is archaeologically acceptable, however much it may disrupt preconceived notions about the existence or persistence of an Early Formative in the Maya Lowlands, and despite a rate of change in Swasey complex ceramics lethargic enough to controvert accepted notions of the speed with which such things should occur. Although the proposed date for the *beginning* of the Swasey phase has excited disagreement among some colleagues, that for its termination at ca. 1000 b.c. falls close to the accepted division between the Early and Middle Formative. The assignment of 1000 b.c. is based on two radiocarbon dates, UCLA-1985a and Q-1476, of 1050 and 1020 b.c., the latter associated with transitional Swasey-Lopez vessels, as noted above. The dating is reinforced by the Barton Ramie date of 1250 ± 205 b.c. for a layer containing ceramics with modal links to late Swasey, and it is not opposed by a date of 730 ± 190 b.c. (Q-1559) for a layer well up in the Lopez sequence in Operation 17B at Cuello. The remaining radiocarbon dates for the Lopez Mamom and Cocos Chicanel levels at Cuello are, although displayed in Figure 1, beyond the scope of this paper; they are discussed in the original publications of the radiocarbon chronology (Hammond, Pring et al. 1976; Hammond, Donaghey *et al.* 1977) and fall well within the accepted limits of the Middle and Late Formative chronology for the Maya Lowlands.

Ceramics

Swasey phase pottery is known from five sites in northern Belize (Cuello, Nohmul, San Estevan, Santa Rita, El Pozito); from Becan, Campeche; and from Mani, Yucatan. The Mani material consists only of the pattern-burnished sherds recovered by Brainerd in 1942, and that from Becan of a handful of sherds, while in northern Belize the material from four sites ranges from a dozen sherds at Santa Rita to about 100 at Nohmul. From the Cuello site several thousand sherds and a score of complete vessels are known, and it is on the basis of this stratified material that the Swasey ceramic complex has been defined and recognized as present at the other sites (Fig. 4).

Within the complex, as in much of the Maya Lowland Formative ceramic corpus, red-slipped groups are numerically dominant. Two monochrome red groups have been defined so far, the Ramgoat and Consejo groups, the latter gradually becoming the commoner through time. They are distinguished by the Consejo material possessing a double slip, with a cream or white underslip below a highly glossy vermilion surface. The Ramgoat Group lacks the underslip, and as a result appears darker overall, with uniform color. Both groups share a range of forms, dominated by dishes and plates with vertical, flared, or curved walls. Rims are direct, with square or round lip. Decoration commonly includes preslip groove-incising below the rim, while more elaborate incised designs, impressed ornaments, modeling, and appliqué occur rarely.

Although red is the major slip color, several others are well represented, in particular the Tiger Buff group, which has a wide range of forms and decorative motifs, including postslip geometric incision. Vessel forms include neckless jars (*tecomates*), dishes with recurved sides, flat-based dishes, and jars with squared-off rims. The jar form is often found with a double cylinder handle crudely attached, a feature which also occurs in the Chicago Orange group. This group and the Copetilla Unslipped group share many forms, although within the latter, necked bottles and jars are most important. This unslipped ware includes a number of pattern-burnished

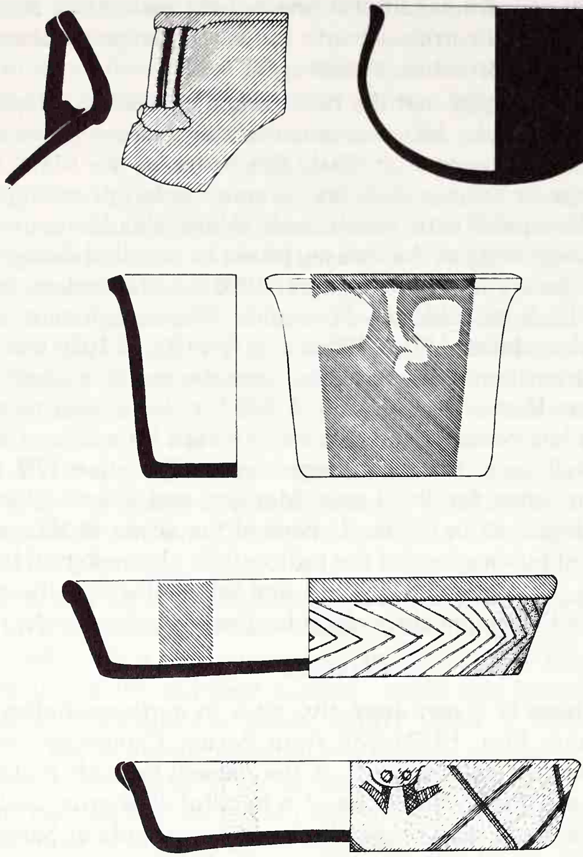

Figure 4. Ceramic types and forms from the Swasey ceramic complex at Cuello: (from top left) Chicago Orange: Chicago variety; Machaca Black: Machaca variety; Ossory Red-on-Orange: variety unspecified; Estero Red-and-incised: Estero variety; Cowpen Incised: Cowpen variety; diameter of lowest vessel is 25 cm. Drawings by Louise Christianson.

sherds identical in design to those from Mani Cenote (Brainerd 1958), with concentric lines and rectangular zones filled with cross-hatching. This material is, at Cuello, concentrated in the lowest levels, indicating a date between 2000 and 1500 b.c.

Other slip colors present include the black Machaca, the brown Stopper, and cream Quamina groups, all sharing essentially the same range of vessel forms as the red-slipped groups. Within the Quamina group, dichrome wares appear in a red-on-cream type (Tower Hill) where the red overslip leaves reserved rectangular areas of glossy cream or white. This type appears only in the latter part of the Swasey phase (1500-1000 b.c.), as do the other dichrome types (black-on-red and red-on-orange). Overall, the rate of change in the Swasey complex in its millenium or more of persistence is slow, but the typological transition into the Lopez Mamom complex around 1000 b.c. is smooth, with many modes persisting, and the status of the Swasey complex as the ancestor of the Middle and Late Formative ceramic tradition in the Maya Lowlands is clear.

Lithics

Artifacts of ground, polished, and chipped stone have been recovered from

Swasey levels at the Cuello site. The ground stone consists of a small number of mano and metate fragments from seed-grinding equipment; whether the seeds ground included cultivated maize, as was the case in later Maya culture, has yet to be established. The raw materials are several varieties of pinkish quartzitic sandstone, the nearest source for which lies in the Maya Mountains of southern Belize some 150 km to the south. The mano form seems to be quasi-cylindrical, the metate a shallow concave trough; the presence of both in the earliest middens of Cuello suggests a sedentary population which nevertheless was able to procure specific raw materials from some distance.

Polished stone includes a number of small circular beads of green jadeite, the earliest associated with a burial of around 1500 b.c. The nearest known source for the raw material is in the Motagua valley of central Guatemala, some 400 km in airline to the south (Hammond, Aspinall *et al.* 1977). Another material from this southern volcanic-metamorphic zone, obsidian, is absent in the Swasey phase, its first appearance being in the Lopez Mamom period, and this precedence of luxury over utilitarian material in the inception of long-range resource procurement is of some significance for the interpretation of such networks (Rathje 1971). The use of jadeite at Cuello is one of the earliest known instances in the New World.

Chipped stone artifacts were recovered in some quantity from Swasey levels. The raw material is a chert, for which two local sources are known. Some of the artifacts have an almost metallic sheen on the unworked surfaces, which has been noted on chert at the Richmond Hill outcrop some 7 km south of Cuello. Alleged chert tools from Richmond Hill (Puleston 1975), which from their lack of associated ceramics have been interpreted as evidence of Early Man, may be refuse discarded by Swasey phase visitors from Cuello in search of raw material.

The second source lies at Colha, 27 km southeast of Cuello, where massive outcrops of brown and gray banded and brown translucent chert are interspersed with many workshops. Ceramic evidence documents use of the site only from Lopez Mamom times onwards, but some discarded artifacts broken during manufacture are morphologically very similar to those of the Swasey phase at Cuello.

A third variety of chert, brightly banded and mottled in several colors, came from an as yet unlocated source and was used only in the Swasey phase.

Technically the artifacts are accomplished in manufacture (Figure 5), although during Swasey as during subsequent periods, some crudely made tools were produced, mainly notched or retouched flakes utilized as knives, scrapers, or planes. A notable feature of the Swasey lithic corpus is the number of thin, parallel-sided blades and tools made on them; these were no longer manufactured when obsidian began to be imported in the Lopez Mamom phase. Functional identity and a function performed better by obsidian are suggested.

The range of lithic forms in the Swasey phase is greater than at any subsequent time, with some forms ceasing to be made in the Lopez phase and others dropping out in the Cocos Chicanel Late Formative period. Some forms, however, persist throughout the regional sequence from the Early Formative through the Late Classic (A.D. 600-900). These include a large, ovate bifacial "general utility chopper," apparently used for felling trees, and an elongated biface with a pointed end. The ovate implements are thicker, heavier, and more carefully finished in the Swasey phase than in later periods, and all specimens recovered have been damaged by very heavy use, which has removed spalls from the edges.

A wide range of smaller axe and adze forms also appears, including examples with squared, ovate, triangular, or T-shaped outline. This diversity may reflect a

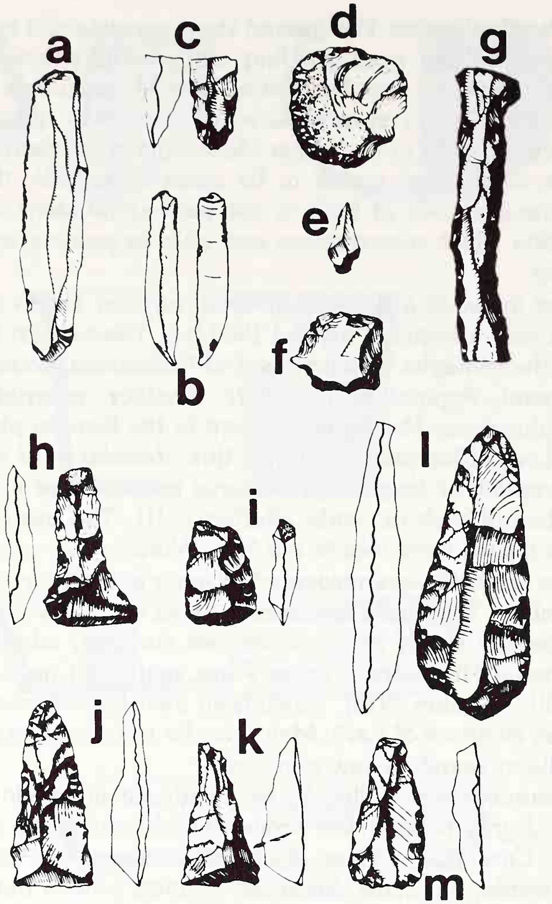

Figure 5. Chert tools from the Swasey phase lithic complex: a, b: blades; l, large oval biface; c, pointed biface; d, discoidal knife/scraper; e, projectile point or drill; f, retouched flake; g, retouched blade; h-k, m, small axe and adze types, some with tranchet sharpening retouch. Scale: e is 2.5 cm long. Drawings by Richard Wilk.

range of specific functions rather than lack of standardization, since all the tools are carefully made; microwear analysis in progress may help to answer this question.

A single unifacial point was recovered from Swasey levels. The steep retouch near the point suggests a function as drill or punch rather than as projectile tip, but this latter function cannot be excluded; the specimen would as such be unique in the north Belize Formative sequence.

In general the Swasey phase lithic industry exhibits careful selection of raw material from at least three sources up to 27 km away, a diversity of forms, and a high standard of workmanship. Although the range of artifact types decreases in the Middle Formative and later, there is clear technological and typological continuity from the Early Formative.

Architecture

Knowledge of Swasey phase buildings derives entirely from the Cuello site, where two 5 x 5 m areas, set cornerwise to give continuous 10 m sections N-S and E-W, were excavated in 1976. In each area a superimposed series of structures was exposed, bordering the northern and western edges of a plastered patio. The eastern

and southern sides remain unexcavated. The structures were all buried by the massive Late Formative Platform 34; the final period of construction took place ca. 750 b.c., and the structures were ritually demolished and buried ca. 400 b.c. These Middle Formative buildings had basal platforms of large limestone boulders supporting a stone-walled superstructure, the whole being covered in white plaster. The "deconsecration" involved the blocking of the central doorway, filling in of the patio with chert and limestone rubble brought from at least a 2 km distance, laying of a temporary pavement to preserve access to the last moment, and the subsequent sinking of a *bothros*, a pit filled with smashed vessels, over the threshold of the buried building from the surface of the later platform 1 m above. The nature of this "deconsecration" argues a public rather than domestic function for the buildings and the patio group as a whole. This conclusion is of some interest, since the final Middle Formative buildings overlie several phases of Early Formative structures, with frontage lines carefully maintained over more than a millennium. A function for the Early Formative buildings as shrines is possible, but the lack of coeval structures not only in the Maya area but in Mesoamerica generally gives us little comparative material.

Three successive phases of construction, within the period defined by the Swasey ceramic complex and associated radiocarbon dates of 2000-1000 b.c., have been discerned, each with several subphases of running repairs and reflooring. These construction phases have been dubbed I-III, the last formally divided into III and IIIA. In III-IIIA the structure on the northern side of the patio is almost entirely destroyed, while that on the west is badly damaged. Enough remains, however, to indicate that a perishable superstructure with a timber frame stood on a basal platform some .60 m high; only the southern part of the frontage was exposed in the excavations, but this demonstrated that the platform was well in excess of 5 m long, with the southern end of the façade curving back westwards to a rounded or elliptical side wall. At the beginning of the curve a stepped niche was set back into the frontage, with a plaster lining coterminous with that of the platform as a whole; this original building feature had been relined with a second layer of plaster .05 m thick, apparently because of wear. This suggests that the niche was a step to give access to the platform. Its eccentric position at one end of the façade suggests bilateral symmetry—a similar niche at the northern end—and the narrowness of the niche, .70 m, allows us to surmise that it was not the principal means of access to this large platform, but that some centrally placed and more impressive step or stair was also present. This surmise can be tested by excavation: if correct then the length of the platform must be at least 12 m, while the curvature of the exposed position of the southern end indicates a width of at least 4 m. The nature of the superstructure must remain conjectural since the platform surface in the area excavated was heavily eroded. This construction phase dates to ca. 1300-1400 B.C.

Construction phase II survives below III-IIIA on the western side of the patio (the northern structure being almost totally destroyed), and is in a much better state of preservation. It consists of a platform some .40 m high, with a plastered surface and western front. The plaster is coterminous with that surfacing this phase of the patio, indicating unitary, planned construction. The top of the platform is edged with small limestone cobbles to bolster it against erosion (Fig. 6). The fill of the platform is of redeposited primary midden of earth with sherds, shells, debitage, and burnt wood. Two radiocarbon dates on this last material, noted in the section on chronology, are of 1810 ± 85 b.c. and 2050 ± 155 b.c., but these clearly date the original deposition of the midden and not the platform. A likely date for construction of phase II would be

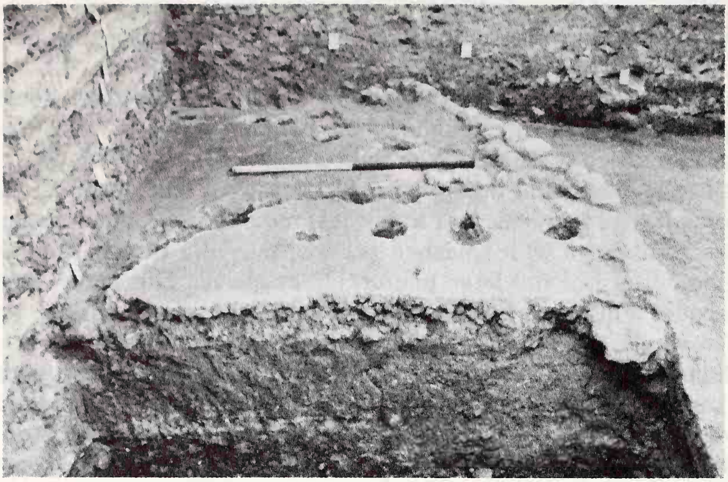

Figure 6. Part of the platform on the west side of the patio in construction phase II at Cuello (Square A). Two periods of surfacing can be seen, the second with curved outline; the edge of the platform is bolstered with stones. The fill is of redeposited soil and trash (layer 239) over a thin plaster floor (241) resting on the dark occupation layer (230) trodden into the old land surface. Part of the patio floor is at right. Scale in .5 m divisions.

1600-1700 b.c., so that some 200 ± 50 years would have passed between the primary and secondary deposition of the midden.

The top surface of the platform has two layers of plaster, the later of which seems to have floored a semicircular structure or exedra; unfortunately the southern part of this feature was removed by a 1975 test excavation (a good example of the dangers of the "telephone booth" technique [Flannery 1976]), but it would be difficult to assign it a domestic function. The earlier floor bore several postmolds towards the northern limit of excavation, indicating an ovoid plan super-structure somewhat shorter than the platform on which it stood. The platform itself seems to have been ovoid in plan and probably about 7 m long by at least 4 m wide.

The earliest phase (I) of Swasey architecture did not lie on the lines of phases II-III, but beneath the patio floor. One quadrant of a possibly circular low platform has been excavated (Fig. 7), with a radius of 3 m. A number of postmolds suggest more than one period of perishable superstructures, while the platform has also been damaged by a series of pits, lined with pottery vessels used as fireboxes, dug from an immediately superior plaster floor. These do not appear to be domestic hearths, and it may be that all the Swasey buildings so far excavated had non-domestic functions. This earliest structure, which stands on the old land surface and dates to perhaps 1900 ± 50 b.c., may have hallowed this spot for the two millennia succeeding.

Our knowledge of Swasey phase architecture may be summarized thus: the earliest structure is a very low and apparently round platform; it was succeeded by several structures laid out around an enclosed patio, on at least the north and west sides, with bowed frontage and rounded ends giving an ovoid plan. These were succeeded by longer platforms, slightly higher, with a straight central façade and such elaborations as inset steps. On all of these bases, the superstructures were of perishable materials, and for none has a complete or even plausibly restorable plan of the superstructure been elucidated. The platforms were oriented at approximately 90° to each other, and as a group are aligned some 8° east of present (1976) magnetic north. Such eastward deviations are a phenomenon common in later periods of Meso-

american prehistory, and the use of a lodestone compass has been suggested (Carlson 1975) in the Olmec period, which overlaps the end of the Swasey phase.

Funerary Practices

Seven burials attributable to the Swasey phase have been excavated at the Cuello site, the skeletal remains of which are described below. Six burials were of adults, one of a child. All were inhumations, five being primary interments of the complete corpse and two being secondary deposits of selected excarnate bones, including the skull and some long bones. Of the primary burials one was flexed on its right side with head to the east, two were extended supine with the head to the north, and one was buried in a sitting position. The position of the child burial was indeterminate.

All seven burials were in graves cut into earlier floors or into the land surface; only one had partial slab covering; the others were merely filled and sealed with plaster. All except for the child were accompanied by grave goods of from two to five pottery vessels. Two burials had a shallow dish inverted over the face; one had a block of tabular chert in place of a skull. The vessels exhibited no consistency of type or assemblage from grave to grave, the forms including deep and shallow bowls, a spouted vessel, a three-handled hanging bottle, a neckless jar, and a miniature vessel. Decoration ranged from unslipped fabric through polished monochrome slips to dichrome and negative-fired wares. The miniature vessel contained powdered hematite, and a small block of this mineral was found in another grave. Two of the burials had bracelets of shell beads, made from Caribbean shells (mainly *Oliva*), and two had small round jadeite beads.

Altogether the seven Swasey phase burials show four modes of interment (flexed, supine extended, sitting, and secondary excarnate); the sex ratio was male four/female two. Jadeite and hematite were found only with male burials (one with jadeite, one with hematite, one with both); decorated pottery vessels were found with both sexes, but a larger sample is needed before either consistency or sex differentiation in funerary rite can be discerned. Similarly, the social standing of those

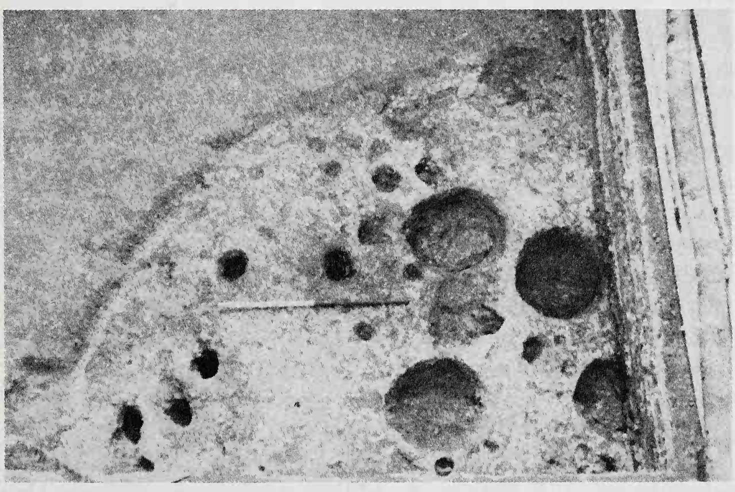

Figure 7. Part of the round-sided platform of construction phase I at the Cuello site (Square B), with occupation debris on the old land surface encroaching at upper left. The postholes are coeval with the platform and give evidence of several successive perishable superstructures, but the large pits penetrate from a slightly later level. Scale in .5 m divisions.

interred in this arguably ritual patio group is unknown; these rites may have been generally used, or applied only to those of elite status.

Human Remains

The only human skeletal remains from the Swasey phase are those from the seven burials described above; no human bone was recovered from fill or midden deposits. One skeleton was of a child of 6-7 years, on the basis of tooth eruption, and six were of adults. Three of these, all male, could be described only as "adult," while the other three, including two females, can be more precisely defined as "young adult" (up to 35 years) on various criteria including nonunited medial clavicular epiphyses and nonunited cranial bones.

There are few indications of disease: dental caries is present in only one adult, and linear enamel hypoplasia, reflecting growth arrest during the formation of the dental crown, is present only in the child. The location of the lesion suggests that it occurred at 3-4 years of age and is related to the loss of maternal protein at weaning; this is a common condition on ancient Maya remains, and its absence from the adults of the Swasey phase is more remarkable than its presence in the child.

Stature could be estimated for only one person, the young adult male in Burial 137, as ca. 167 cm on the basis of femoral diaphysial length. The same individual has a cranial length of 167, breadth of 146, and cranial index of 87.4. The stature and brachycephaly compare with those of Middle Formative burials (#129, #135) from Altar de Sacrificios, Guatemala (Saul 1972). The male skeletons from Cuello are of generally robust build, and a high rather than low health status for the Swasey phase population is indicated.

Cultural modification of the skeleton is absent or rare; there is no dental mutilation and no cranial deformation, although irregularities on the front bone of one female skull (Burial 232) may be due to the use of a tumpline (forehead sling) for load carrying. There is pronounced dental attrition in most of the adults, indicating the ingestion of much grit; this may be due to the use of sandstone seed-grinding equipment or to the use of crushed lime in steeping maize; both are causes of tooth wear in modern Maya.

Economy

That the Swasey phase inhabitants of the Cuello site were sedentary is suggested by their architecture, ceramics, and heavy ground-stone equipment. The latter also suggest that the collection or cultivation of seed crops contributed to the economy. Cultivated crops could have included maize, which had long been domesticated in the highlands of Mesoamerica, and locally available plants would have included the breadnut or *ramon* (*Brosimum alicastrum*), which was certainly known to the later Maya as a famine food. Ethnographic data on later Maya diets could be projected back to suggest a plausible economic base for the Swasey phase, but in the absence of identified plant remains this would remain speculation. The recovery of carbonized material by wet- and dry-sieving in 1976 suggests that flotation might yield more significant results; the 1976 material is still being analyzed by Barbara Pickersgill at Reading University, England. Additional data may come from the analysis of opal phytoliths; large numbers of these have been isolated from a sample of the re-deposited early midden (17F 239) by A. Miller of Washington State University. The most common were cell casts of maize or a maizelike plant, with a "dumbbell" shape (Fig. 8) already noted in South American maize samples. Miller also analyzed a sample from the old land surface (layer 17F 230); no phytoliths were found. It is

impossible to say at present whether this is the result of differential preservation of opal, or whether the maizelike plant was in fact introduced to the site from elsewhere between the date of occupation on the old land surface (2000-1900 b.c.) and the deposition of the midden (ca. 1900-1800 b.c.). The latter circumstance, if substantiated, would suggest contact with highland Mesoamerica around 1900 b.c., but also that the diet of the first settlers did not include maize or its relatives. (Flotation of a small area of Swasey deposits, including the old land surface, in the 1978 field season by Charles Miksicek produced many fragments of carbonized maize cupule and kernel of a small-cobbed race and also fragments of root crop rind. The maize is apparently in all levels from the old land surface upwards, resolving the ambiguity in the phytolith evidence; a further check will be made with the excavation and flotation of a large area of Swasey deposits in the January-March 1979 field season.)

Animal bones were well preserved, and species identified include those heavily exploited for subsistence in later periods. Predominant were white-tailed deer (*Odocoileus virginianus*) at 27.2% of the numerical total and 21.8% of the minimum number of individuals (MNI) identified, musk turtle (*Kinosternon*) at 13.0% (11.5% MNI), dog (*Canis familiaris*) at 10.5% (10.3% MNI), and nine-banded armadillo (*Dasypus novemcinctus*) at 7.4% (9.0% MNI). Remains of rabbit (*Sylvilagus brasiliensis*), agouti (*Dasyprocta punctata*), paca (*Agouti paca*), and collared peccary (*Tayassu tajacu*) are also present, together with pond turtle (cf. *Chrysemys* sp.).

Nearly 70% of the number of individuals identified come from only six species: deer, dog, musk turtle, pond turtle, armadillo and brocket deer (*Mazama americana*). The mammals exploited at Cuello in the Swasey phase are species adapted to living in disturbed areas or those with second-growth vegetation. Species characteristic of denser forest, such as tapir, monkeys, coati, and white-lipped peccary, are absent. The faunal assemblage from Cuello is similar to that from the nearby Formative and

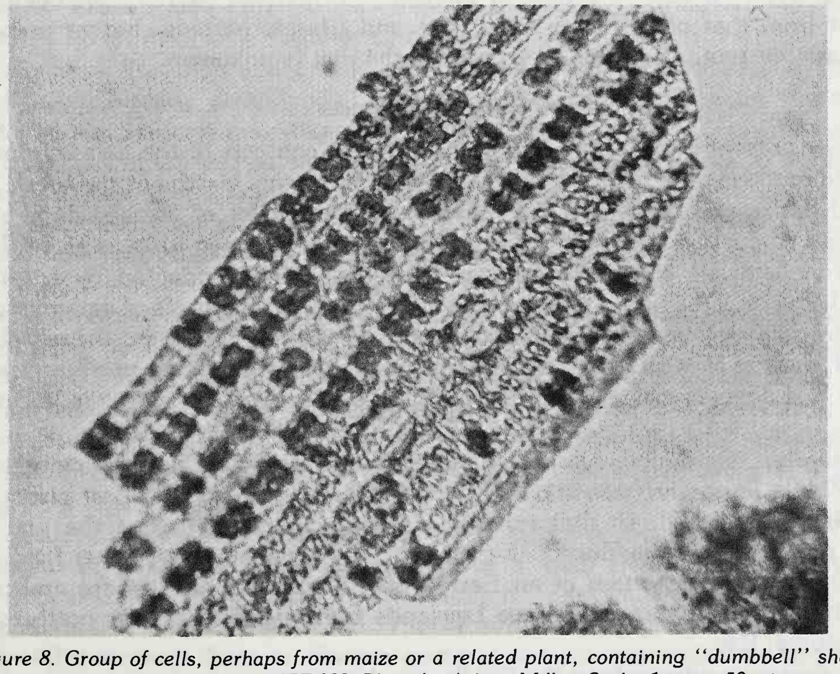

Figure 8. Group of cells, perhaps from maize or a related plant, containing "dumbbell" shaped opal phytoliths, from layer 17F 239. Photo by Arlene Miller. Scale: 1 in. = 53 microns.

Classic period site of Nohmul, which is similarly located on the crest of a low limestone ridge between two river valleys; this suggests that no great changes in the exploitation of vertebrate fauna occurred over the three millennia from the beginning of the Formative to the middle of the Classic.

Aquatic species comprise some 25% of MNI at Cuello, including in addition to turtles three small fish species, all of which could have been obtained from the Rio Hondo or Rio Nuevo or from standing water in bajo areas. The mollusca recovered similarly suggest exploitation of damp areas, since 83% of the Swasey phase sample are of the freshwater swamp species *Pomacea flagellata* and a further 4% are of freshwater stream species. Forest species total only 8% and marine species 3%. None of the common species representative of burnt-over land (*Neocyclotus dysoni cookei*) is present in Swasey, suggesting that swidden agriculture was not practiced in the vicinity of the Cuello site at that period. In the succeeding Lopez phase after 1000 b.c., however, *Neocyclotus* appears strikingly at 55% of the total mollusc sample while *Pomacea* drops to 16%. A speculative connection with the clearance of land for swiddening and the draining of swampy areas to construct raised fields could be advanced (together with the radiocarbon date of 1110 ± 230 b.c. [17877A] for a raised-field system on the Rio Hondo), but other explanations for the changes may be equally plausible.

The sum of the economic evidence suggests that the environment of Cuello in the Swasey phase was already disturbed or regenerate forest, the disturbance due probably to the inhabitants of the site, with seed crops being either cultivated or collected. Cultivation did not include the burning of felled bush, at least near the site. A number of animal species were preferentially exploited by hunting or trapping, including land animals, swamp dwellers, and aquatic species, the latter probably from the rivers some 5 km distant. Dog was probably domesticated and kept for food; one Swasey phase animal effigy with a nose-band or muzzle seems to be the Mexican hairless variety. Overall the economic base of the Early Formative may not have been greatly different from that of the later Formative and Classic periods, but at present the contribution of root, seed, and tree crops to the diet is unknown.

External Contacts

In our present state of knowledge the external contacts of the Swasey phase are restricted to those detectable at the Cuello site. From this viewpoint the other sites in northern Belize and elsewhere that have yielded ceramics of Swasey date could be considered contacts, although evidence of interaction between them is as yet lacking; the current analysis of thin-sections of ceramics being conducted by L. Jones at London University may document intersite exchange. On the basis of ceramic typology alone, the Swasey ceramic sphere would seem to be restricted to northern Belize and adjacent areas at Mexico. A single Swasey type is found far to the north at Mani, but whether this denotes exchange or an enlarged Swasey ceramic sphere is uncertain at present.

Similarly, the double-cylinder handle on jars is found at approximately the Early/Middle Formative transition at Barton Ramie and in the earliest phase at San Jose (Thompson 1939), so that connections with central Belize at the end of the Swasey phase might be adduced. In general, it seems likely that further field studies will result in the recognition of an Early Formative interaction sphere embracing a substantial area of the eastern Maya Lowlands from the Belize River north to Becan and Chetumal Bay.

The present evidence from the Cuello site demonstrates contacts even beyond the

boundaries of this hypothetical sphere; the evidence may be divided into direct proof of material import, and indirect, stylistic links. The direct evidence is restricted to imperishable goods of exotic origin; the marine shell from the Caribbean coast 50 km to the east and the chert from Colha 27 km southeast of Cuello would not be considered exotic.

Two classes of artifact found at Cuello are demonstrably exotic: the fragments of a pinkish quartzitic sandstone mano and metate, and the four jadeite beads found with two of the burials. The solid and powdered hematite could also be exotic, but nodules of this material do occur within the local limestone.

The nearest and most probable source for the sandstone lies on the southeastern side of the Maya Mountains massif, south of the granite zone of the Mountain Pine Ridge from which numerous manos and metates were derived in later periods of Maya prehistory. The most accessible sandstone outcrops are some 155 km south of Cuello in airline and about 200 km by boat. The stratigraphic context of the sandstone fragments at Cuello indicates their arrival there by 1900-1800 b.c. at earliest, 1700-1600 b.c. at latest.

The nearest known source of jadeite lies in the Motagua Valley of central Guatemala; the beads, or the raw materials for them, were thus brought from at least 370 km in airline and about 430 km by river and sea, at a date of ca. 1500 b.c. for one burial and ca. 1300 b.c. for the other.

The directly demonstrable contacts of the Swasey phase inhabitants of Cuello were thus to the south, in a region of contrasting geology and differing mineral resources. The easiest routes would have been down the Caribbean coast and inland up the rivers; use of these presupposes the existence of canoe transport, for which direct archaeological evidence in Mesoamerica in the second millennium b.c. is lacking. Contacts within the lowland zone have not been detected, perhaps because the evidence is less obvious, but trace-element analyses of ceramic pastes, which have documented intralowland ceramic exchange in the Classic period (Hammond, Harbottle *et al.* 1976), may detect similar contacts in the Early Formative.

The ceramic tradition and technology present in even the earliest levels of the Cuello site are already developed, indicating that any inspiration for the tradition needs to be sought in areas where pottery was already equally sophisticated by at latest 2000 b.c. Pottery of this antiquity has been reported from Puerto Marquez, on the Guerrero coast near Acapulco (Brush 1965), where the pitted "Pox pottery" has a single radiocarbon date of 2440 ± 140 b.c. in uncertain stratigraphic association. Forms are relatively simple, as is the decorative repertory; exteriors are sometimes red-slipped.

The Pox pottery was compared by MacNeish (MacNeish *et al.* 1970) to the Purron ceramics from the Tehuacan Valley in highland Mexico, which are dated to between 2300 and 1500 b.c. by interpolation of this archaeologically evanescent phase into the Tehuacan radiocarbon chronology. Neither Purron nor Pox has any strong resemblances to Swasey pottery, whichever of the three is earliest; the only modal similarity occurs late in the Swasey phase when two ellipsoidal *tecomates* occur in a grave at Cuello with a date of earlier than 1230 ± 195 b.c.

In coastal Chiapas and Guatemala, the Barra phase (Green and Lowe 1967; Lowe 1976) begins ca. 1700 b.c., with ceramics varied in both form and ornament and of high technical competence. Decoration includes red-slipping, black-firing, grooving, zoned punctuation, and cross-incision. The vessel forms, slips, and surface finishes are very different from those on Swasey pottery, and no close common origin seems likely. A few sherds from Cuello have a thin hematite slip different from the Consejo

and Ramgoat Red groups and close to the Barra material: importation of a few vessels from the Pacific coast between 2000 and 1500 b.c. is possible. There is a similar lack of general correspondence between later Swasey and the Ocós phase which succeeds Barra, and also the Lagunita phase of the Isthmus of Tehuantepec, dated to 1400-1100 b.c. (Zeitlin 1978).

In the Olmec region of the Gulf Coast the Ojochi (1500-1350 b.c.), Bajio (1350-1250 b.c.), and Chicharras (1250-1150 b.c.) phases at the major site of San Lorenzo possess a ceramic tradition which, at the beginning, is close to Ocós, although black-and-white wares develop strongly later. Here again there seems to be little direct inspiration in either direction, although a possible Gulf Coast import at Cuello is a small vessel with panels of alternate oblique incising found packed with powered hematite in a burial dated to 1020 ± 160 b.c.

Closer to the Maya area along the Gulf Coast, the Pellicer (1350-1250 b.c.) and Molina (1250-1050) phases in the Chontalpa possess bottle forms including one (Azucena Plain) somewhat similar to the Cuello unslipped bottles, but few other modes suggest comparison or contact (Sisson 1977). Chontalpa-Mani resemblances may, however, be worth further study.

Thus none of the areas in which pottery became established between 2000 and 1000 b.c. in Mesoamerica seem to have either inspired or been inspired by the Early Formative tradition of the Maya Lowlands.

Beyond Mesoamerica, pottery is found at Monagrillo in Panama ca. 2140 b.c. (Willey and McGimsey 1954), but only isolated modes resemble Swasey ceramics. One anomalous sherd from Cuello possesses the deep punctuation terminating an incised line, which is characteristic of the decorated Monagrillo types, and may be a Panamanian import. Data are lacking for the rest of Central America, although the Eo-Archaic at Yarumela (Canby 1951) uses pattern burnishing and may be worth further investigation.

In northwestern South America, pottery in a range of styles and techniques is found in the third millenium b.c. from the Gulf of Guayaquil north to the Gulf of Venezuela, with notable sites including Real Alto (Lathrap *et al.* 1977), Valdivia, and its cognates (Meggers *et al.* 1965), all in Ecuador, and Puerto Hormiga (Reichel-Dolmatoff 1965) in Colombia. This material is all essentially different from the Cuello ceramics, but some modal similarities have been discerned between the Valdivia ceramic complex and the Swasey by D. W. Lathrap (personal communication).

Swasey ceramics seem to have no clear ancestry anywhere in the Americas. The diversity of the Mesoamerican material after 2000 b.c. indicates that any common ancestry must lie much further back in time, and separate origins seem more likely. An earlier developmental phase of Swasey in the Maya Lowlands, perhaps at the Cuello site, is plausible and can be investigated by excavation; this Early Formative was itself unknown only three years ago, and a Maya Lowland ancestry in the third millennium b.c. would not be surprising.

Summary

An Early Formative period of occupation has been detected at a number of sites in the eastern Maya Lowlands, principally in northern Belize, where excavations have been carried out at the Cuello site. A radiocarbon chronology for this period, dubbed the Swasey phase, indicates a time span of 2000-1000 b.c., 2500-1300 B.C. Earlier dates back to 3200 b.c. (4000 B.C.) may indicate prior occupation. Ceramics of the Swasey phase are, from their first appearance, sophisticated technically and artistically and are clearly ancestral to the Maya Middle and Late Formative ceramic com-

plexes. The lithic sequence is similarly continuous; stone artifacts include imported seed-grinding equipment, imported jadeite beads, and local chert tools in a range of types perhaps geared to specific functions.

Buildings had raised basal platforms with curved sides, rubble or earth fill, and plaster covering; they were set around a small patio in a quasi-formal layout. Superstructures were timber framed and walled and roofed with perishable materials. Basal platforms became larger and more elaborate through time. The patio layout was first used ca. 1700-1600 b.c. and thereafter persisted on carefully conserved frontage lines to the end of the Middle Formative (ca. 400 b.c.). A nondomestic function for the buildings excavated seems likely. Within and between them people were buried in a range of positions and with variable grave goods; their overall health seems to have been good.

The subsistence economy included the utilization of seeds, collected or cultivated; arguably but not provably other plants; the gathering of edible mollusca; hunting of deer, armadillo, and other species on land and turtles in the river; and fishing. Dog, presumably domesticated, was also eaten. (The 1978 excavations confirm the cultivation of maize and root crops.)

Sites of the Swasey phase are presently concentrated in northern Belize, but ceramics of the Swasey ceramic sphere are known from sites in the central and northern Yucatan Peninsula. External contact with southern Belize and central Guatemala is demonstrated by imported minerals, but typological comparisons with other early ceramic complexes in Mesoamerica and South America do not suggest any direction of inspiration for the emergence of the Swasey style. No other pottery in Mesoamerica is demonstrably earlier, and none of equal sophistication appears until the Barra complex of coastal Chiapas ca. 1700 b.c. The dissimilarities between Swasey, Barra, and the Mexican highland ceramics suggest independent invention or adoption of pottery in at least three regions of Mesoamerica. The discovery of an Early Formative occupation of the Maya Lowlands indicates that this region was not, as has been suggested, late in settlement or development, but that in early times as in late the Maya played an important role in the emergence of Mesoamerican culture and civilization.

—1979

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12

Abaj Takalik: The Olmec Style and its Antecedents in Pacific Guatemala*

by John A. Graham

Olmec style stone sculpture is most famed from its occurrence in a relatively small area of southern Veracruz and western Tabasco of southern Mexico, a district often termed "the Olmec heartland." Roughly two hundred stone monuments at present constitute the corpus of sculpture from this area, ranging from some truly colossal, multi-ton carvings to works smaller than life size and extending from true sculpture in the round to a large body of relief work of diverse kinds. Almost half of the known corpus derives from only two archaeological ruins, La Venta and San Lorenzo, the only Olmec sites of the "heartland" to have received some excavation beyond that of a preliminary, exploratory character. The chronology of this sculptural tradition has been the subject of the most divergent interpretation over the years, although at present most students agree in placing much of the work within the first millennium B.C. Unfortunately, precise calendar ages such as one frequently encounters confidently put forth in both scholarly texts and popular literature rest upon subjective evaluation of often quite ambiguous evidence and a variety of conjecture and traditional assumptions. Not only does the time of the first appearance of a clearly recognizably Olmec monumental sculptural style remain to be demonstrated satisfactorily, but so also its duration through time and its final demise remain questions for which satisfactory solutions have yet to be obtained.[1]

Additionally, the origins of this great and fascinating sculptural art of ancient Mesoamerica have been the subject of only limited speculation, sometimes of a rather fantastic nature, and even less substantial investigation. Some considerations of

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Olmec style have placed more stylistically developed exemplars of the "heartland" at the very beginnings of hypothetical schemes of development, thus even more dramatically emphasizing the absence of apparent antecedents and origins. Since quarries and sources for the stones most commonly employed for Olmec sculptures at such important "heartland" sites as La Venta and San Lorenzo are lacking, the miniature highlands of southern Veracruz, the Tuxtlas, demonstrably the source of much stone employed by Olmec carvers, has been suggested as a possible locus of origin by some writers. However, only more extensive and intensive investigation of that little-studied region can provide a reasonable basis for evaluation of this interpretation.

It is well known, however, that Olmec stone sculptural art has been found in solitary examples or in small quantities at a number of localities beyond the Veracruz-Tabasco district, and such intriguing discoveries increase in number with the passage of years. Considerations of these occurrences have sometimes been formulated in the context of trading factories (especially for raw materials), imperialistic expansion, and even cult or religious evangelization. Occurrences of Olmec-related materials south of the Valley of Mexico, in Guerrero-Morelos, have been interpreted by a few as reflecting a "proto-homeland." In discussions of these far flung discoveries of Olmec style monuments and other remains, Pacific Guatemala has received relatively little attention, in part simply because not much of the material has been well known or adequately published.[2] Since 1976, however, investigations at Abaj Takalik in Guatemala have brought to light a substantial corpus of Olmec monuments, and these discoveries necessarily reopen the question of the significance of "beyond the heartland" or "colonial" Olmec carvings as well as the matter of antecedents and origins.[3]

While it is not the aim of the present essay to analyze and describe the formal properties of Olmec style, a digression here to note in brief some of these aspects of Olmec sculpture may be in order, considering the numerous erroneous and misleading generalizations which have been made and continue to be slavishly repeated in so much of the literature. At fault here is the conspicuous failure of many New World archaeologists to distingish between formal properties—those basic aspects of any art style which reveal so much about the "vision" or apprehension of form unique to its creators—and iconographic or thematic elements which can be and repeatedly are passed not merely from one style to another but from one culture to another, often with minimal modification. To clarify these points most succinctly, it is probably simplest pedagogically to cite the oppositions and contrasts of Izapan and early Maya sculptures in relation to which Olmec art is most frequently discussed.

In contrast to both Izapan and early Maya art, the Olmec style is above all characterized by a preoccupation with volume, that is a feeling for full, swelling masses, which, together with consistent application of a highly refined system of proportion, accounts for the overall impression of grand, inherent monumentality which distinguishes even the smallest of fine Olmec objects.

Izapan art, on the other hand, with only a very few exceptions, displays almost no feeling for volume, systematic proportion, or monumentality, but concerns itself instead almost entirely with the sometimes amazingly sophisticated creation of notional or depicted space, a natural predisposition for artists whose chief purpose seems to have been the depiction of narrative scenes often depending to great extent on movement and dramatic action for their clarity and effect.

The early Maya reveal yet a third and quite different mode of apprehension, a mode which parallels, or perhaps more accurately presages, later "Classic Maya" traditions. The subjects, predictably, tend toward elite portraiture of rather static nature whose unmistakable identifying characteristic is the typical Maya predisposi-

tion toward conceptions based upon elaborate two-dimensional surface pattern. There is no attempt at, indeed there is a conscious suppression of, indications of depicted space, a deliberate flattening for decorative effect. Similarly, volume and monumentality hold little interest for the early Maya though they were willing, as at Abaj Takalik, to go to great lengths to achieve impressive, grandiose effects—this, however, through colossal scale.

In the case of Olmec art it is often surprisingly claimed by writers on the subject that it is characterized by a naturalistic depiction of human anatomy, even such elements as musculature and indications of bone structure being often, consciously or unconsciously, injected into drawings of Olmec figures by otherwise quite talented draftsmen. Comparison with clear photographs will usually make this almost shockingly apparent. One finds it difficult not to suspect in this approach a projection of the mindset prevalent with many students of the subject—a determination to equate the "classic" styles of Western European art with what this theory perceives to be the parallel position of Olmec art as the "classic" art of the New World.

It should come as no surprise that a figural art emphasizing simplicity of forms and an often almost "inflated" quality (devices used to emphasize the predominate objective of full, spatially assertive masses), would naturally minimize or even ignore many of the elements of naturalistic anatomy. Even appendages such as hands and feet are typically not treated in detail but are instead usually portrayed in a stylized and sometimes even crude manner. The full, swelling quality of the Olmec ideal recalls not so much the "classic" art of Europe as it does the voluptuousness of much of the art of ancient India, though lacking its beauty of movement and offering instead a somewhat inert monumentality which projects most impressively in the more successful works. Large-scale Olmec sculpture is not only lacking in dynamic movement (cf. Covarrubias, Stirling, *et al.*) but is instead solid, stationary, and "fixed" in aspect.[4]

* * * * * *

The ruins of Abaj Takalik are situated upon the lower Pacific piedmont of Guatemala a short distance northwest of the modern departmental capital city of Retalhuleu, a fertile zone where natural boulders of all shapes and sizes occur in great abundance. The extensive archaeological remains include numerous constructions of earth, at times utilizing adobe brick and facings of stone cobbles as well as a distinctive local material of varicolored appearance for floorings. Edifices were arranged upon great terraces which successively step up the sloping piedmont gradient. Several hundred sculptured and plain stone monuments, stelae, altars, and other carvings have been found in the ruins despite the extreme difficulties of exploration resulting from the burial of the remains beneath modern volcanic ash deposits and coverage of the surface with economically valuable crops which cannot be stripped to facilitate investigations or permit substantial exposures of archaeological features. Although sculptured stone monuments from the ancient ruins have been noted in the literature since at least the nineteenth century, it was not until modern explorations of the site commenced in 1976 that Abaj Takalik has been recognized as one of the most important sculptural centers of pre-Columbian Mesoamerica now known to archaeology. In fact, upon the basis of present knowledge, Abaj Takalik is quite unique when the number of its stone monuments, their frequently great size or monumentality, and the diversity of sculptural styles present are all taken into consideration. The site's cultural and historical significance is further emphasized by the fact that a sequence of

sculptural development is present which strongly appears to reach back to the very beginnings of monumental stone sculpture. The ruins, on the present evidence, appear to have been occupied at least as early as the third millennium B.C., and it is interesting to note that present-day inhabitants of the site, as well as pilgrims from afar, continue to venerate both sculptured and plain monuments of the ruins while local legend holds that it is here that the world began.

In considering a sculptural sequence, among the preliminary and fundamental archaeological problems to be resolved, or at least to be considered in detail prior to more extended interpretation of the sculptures discovered in an archaeological site, is the issue of whether the works in question are in fact of local manufacture, commissions from other metropolitan centers of sculptural production, or antiques or booty imported from elsewhere. Fortunately, at Abaj Takalik there can be no question that some of the sculptures were in fact executed at the site, and this establishes that at least during certain periods of the ruin's history (including the Olmec epoch) there were resident sculptural workshops. The fact that, with a single important exception, all major Abaj Takalik sculptures known at present are carved from locally abundant andesite boulders, some even in their natural geological context, together with a number of other considerations, reinforces the case for Abaj Takalik being one of the primary great centers of ancient sculptural art in Mesoamerica.

The collection of Olmec style monuments at Abaj Takalik now known, which certainly represents only a portion of the sculptures still to be unearthed there, includes a remarkably full range of Olmec sculptural types, extending from sculpture in the full round through high and low relief. One of the most interesting discoveries, since in the popular conception of Olmec art the type is almost a hallmark of Olmec sculpture, is Monument 23, a colossal head (Figs. 1 and 2). Since nearly a score of

Figure 1. Abaj Takalik Monument 23, side view.

Figure 2. Abaj Takalik Monument 23, front.

Figure 3. Abaj Takalik Monument 14. Drawing by James Porter.

these remarkable sculptures is known at present from Veracruz-Tabasco, its presence at Abaj Takalik, at present a unique occurrence outside of the ''heartland,'' is particularly noteworthy. While colossal carvings of the human head are shown from other sites in Pacific Guatemala, the largest collection at present being known from Monte Alto, Escuintla, Abaj Takalik Monument 23 is entirely distinct from these, and it is clearly closely related stylistically to the Veracruz-Tabasco examples: the shape of the head, the treatment of the ears, their size, placement, and adornment, all relate Monument 23 to the Olmec Gulf coast examples and contrast strongly to known Pacific Guatemala carvings. The great interest in this sculpture is further enhanced by the fact that it illustrates sequent phases of carving: the facial features of the colossal head were re-worked by later Olmec artists to convert the nose and lips into a human figure, seated tailor fashion within a niche, yet another classic Olmec theme.

Another impressive and particularly powerful example of Olmec style at Abaj Takalik is the relief carving, Monument 14 (Fig. 3). A squatting figure is presented within a stylized open mouth, the carving ranging from highly rounded relief to quite flat and even incised passages, accentuating the fullness of the human form that is so typical of the emphasis on volume in Olmec sculpture. A small animal is held in the crook of each arm, a small feline and a hooved creature, the theme recalling the archetype of the master or, considering the squatting posture and possible suggestion of breasts, mistress of the forest and animals. It is instructive to compare this sculpture in its handling of various depths of relief as well as the ''kenning'' effect of the headdress-upper lip to Stela 2 of La Venta.

Also definitely Olmec are the features of one of the most recent discoveries, Monument 55, a detached human head of heroic size (Fig. 4). The dramatically "snarling" mouth and masterful arrangement of forms make it unmistakably Olmec, while the "closed" quality of its conception perhaps suggests an early placement.

Even the familiar Olmec sculptural category of rectangular "altars," so limited in their occurrence even in the "heartland," is probably to be included in the array of Olmec carving at Abaj Takalik in the presence of Monument 57, of which only a corner fragment has thus far been recovered.

With only two exceptions known at present, the Olmec style carvings of Abaj Takalik were subjected to the common, worldwide practice of reuse during the long history of the site's occupation. In their final settings, some of the Olmec monuments were placed in alignments and arrangements with other carvings of entirely different styles and periods of creation. In effect, later inhabitants of Abaj Takalik were creating some of the most ancient "museum displays" of the New World.

An obvious question of crucial importance with respect to the Olmec sculptural art of Abaj Takalik is its source and its place within the site's complex sculptural history. Since almost all of the Olmec sculpture of Abaj Takalik thus far excavated has been found to have been last reset quite late in the site's history, the archaeological dating of placement, as so often is the case, does not provide very useful information bearing upon the age of creation. And, of course, the Olmec sculptures lack the usual inscribed hieroglyphic dates which are found on a number of the Maya sculptures of

Figure 4. Abaj Takalik Monument 55.

Abaj Takalik and which relate those works to the late centuries B.C. and early centuries A.D.[5] Dating and relative placement must therefore proceed on other bases.

Since it does not seem likely that radically different styles of sculptures, each represented by a number of major works, which utilize quite different technical methods and which represent considerably differing conceptions, aims, and degrees of sophistication would be contemporaneous products of the same pre-industrial center, it follows that time is a logical basis upon which to explain such differing works. If a readily observable and plausible sequence of development, even if entirely hypothetical, can be seen in the corpus of carvings, then an arrangement of the sculptures in a temporal-developmental history is encouraged. Further speculation is encouraged when it is noted that the sequence conforms to such generally accepted broad formulations as "the usual course of development in style in all periods (is) from solid and simple to more open and complicated" (Canaday 1980:40). Finally, extremely important clues to sequence may be discovered in a sculptural corpus where some pieces exhibit evidence of recarving, yielding a form of sculptural stratigraphy somewhat reminiscent of palimpsests; the dramatic example of recarving in Abaj Takalik Monument 23 has been cited previously and is only one of several such examples preserved at the site. With such principles in mind as well as other considerations which space does not allow elaboration upon here, let us consider the possible sources and antecedents of the classic Olmec art of Abaj Takalik.

A large number of sculptures at Abaj Takalik may be referred to as boulder sculptures. By this term I refer to the use of large stones in which the natural contours remain substantially recognizable or distinguishable. The natural form of the boulder may be entirely unmodified (in which instance it is only the incising, grinding, or grooving of features that makes the boulder a sculpture), slightly altered, or considerably modified; the essence of the definition rests upon the recognition of the original volume and contours of the boulder. Boulder sculpture at Abaj Takalik occurs in both basic types, relief and sculpture in the round. Relief boulder sculpture is the modification of a surface or various surfaces of the boulder without the volume of the boulder constituting a basic component of the sculptural conception; such work is sometimes referred to as a petroglyph by archaeologists. Boulder sculpture in the round, on the other hand, utilizes the natural shape and volume of the stone, unmodified or modified to varying degrees, to constitute a basic quality of the conception. Although boulder sculpture was produced during many different periods in varied cultural contexts, its great importance lies in providing the sources of some of the early advanced sculptural developments of Pacific Guatemala.

At Abaj Takalik some of the simplest boulder sculptures known at present were created by the addition of two round, staring eyes, ground and/or incised into the stone, simple in conception but powerful in the haunting fixity of their gaze (Fig. 5). In some instances there is no immediate, at least to our sense, suggestion of a life form in the natural contours of the boulder; in other instances, the eyes enhance a purely naturally shaped stone which was clearly selected for its implicit recollection of a human or animal form. In the former instance, Abaj Takalik Monument 38 (Fig. 6) is of the greatest interest in representing a possible initial stage of the "potbelly" boulder sculpture tradition. These rotund sculptures, commonly representing human subjects, are known from many sites in Pacific Guatemala and beyond. At present the largest corpus of these sculptures on the Pacific piedmont derives from Abaj Takalik where they range from extremely primitive boulder sculptures through true sculptures in the round, works of increasingly naturalistic conception and technical execution. In Monument 38 concentrically incised ovoid lines represent the eyes of a now greatly

Figure 5. Abaj Takalik Monument 1-A.

Figure 6. Abaj Takalik Monument 38.

damaged boulder which crudely suggests the potbelly theme. Modification of the fortuitous natural shape of the boulder appears to have been minimal, or nil.

In contrast to Monument 38, Monument 41 (Fig. 7) illustrates rough shaping and modification of the boulder form through coarse hammer dressing of much of the surface. The head of the figure is indicated here by simple facial features as well as eyes, with no indication of a neck to differentiate the head from the body and with no attempt at the development of a naturalistic torso, the body being suggested only by primitive ''belly clasping'' arms.

The early boulder sculptures represent zoomorphic as well as anthropomorphic themes, both of which follow similar developmental and stylistic histories. One of the better preserved and elaborated examples of the former is Abaj Takalik Monument 6, the upper portion of which was exposed in the bed of a road cutting through the archaeological ruins (Miles 1965:Fig. 10b). This boulder, of substantial size, was removed to the National Museum in Guatemala City a dozen years ago where it may be seen today. The late S. W. Miles, responsible for the rescue of the monument, stated ''the small sample of pottery from fill over and around the head is early to middle Preclassic'' (*ibid.*:247), and while this does not constitute sufficient evidence to place the sculpture in an early stratigraphic level, the suggestion that the sculpture may have occurred in an early context is enhanced by the fact that the road level from which the carving derives cuts very deeply into the archaeological deposits of the ruin in this area. While Monument 6 shows no modification of the boulder's form, reliance being placed upon incising and grooving to suggest an amphibian head (with additional features), other zoomorphic boulder sculptures such as Monument 47 have partly dressed surfaces, some shaping, and rudimentary indications of limbs. This sculpture, a much more advanced conception, represents a toad or frog, an important sculptural theme in Pacific Guatemala, and reflects a careful search for a boulder form of an appropriately suggestive natural shape.

Other carvings in the potbelly tradition display increasingly well executed dressing of the stone with the head becoming increasingly differentiated from the body by a neck, with shoulders and chest becoming ever more distinguishable from the belly although arms continue to be primitive, ''belly clasping'' appendages (Figs. 8, 9, and

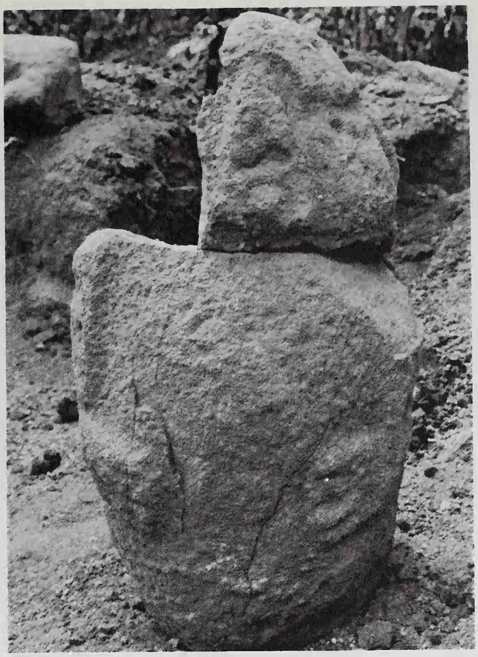
Figure 7. Abaj Takalik Monument 41.


Figure 8. Abaj Takalik Monument 2.


Figure 9. Abaj Takalik Monument 40.

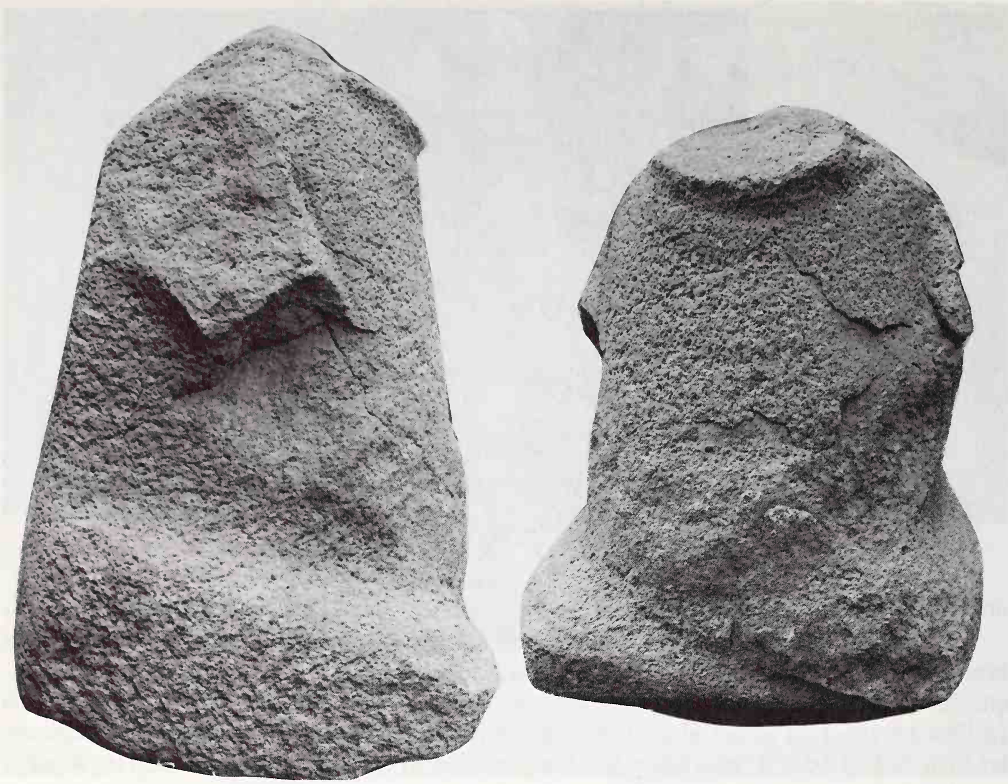

Figure 10. Abaj Takalik Monument 46, side and front views.

10). Legs now appear, sometimes simply wrapped around, sometimes crossed, and gradually moving beneath the body in a more anatomically feasible conception of supporting the seated figure. Finishing and anatomy become ever more accomplished, the limbs in increasingly high relief, legs and buttocks in some cases even being finished on the underside. The developmental series grades into typically Olmec conceptions of the crossed legged, seated figure. Clearly in this respect it is well to recall the Sin Cabezas sculptures, masterful works of indisputable classic Olmec style of which Sculpture 3 is a strikingly unmistakable potbelly (Fig. 11).

While it is not claimed that this is necessarily an unalterable sequence of development which proceeded along identical and precise lines everywhere in Pacific Guatemala where boulder sculpture and early Olmec carvings are found, it is argued that a general and overall sequence of development is represented which accounts at the very least in part for the emergence of some typically Olmec sculptural forms.[6]

One example of ''sculptural stratigraphy'' from Abaj Takalik providing independent support to the developmental schema discussed above is Monument 40 (Figs. 9 and 12). This is a potbelly sculpture of an advanced type in the sense that very little of the original boulder form has survived. What has survived, however, in this otherwise carefully dressed carving is an old, unprepared surface on the back of the potbelly head. Here the distinctive ''staring eyes'' of the simple, earliest type of Abaj Takalik boulder sculpture may be easily discerned. These antique features obviously were valued, perhaps even revered by those who later so thoroughly and finely dressed the stone, and thus were carefully preserved.

Figure 11. Sin Cabezas Sculpture 3.

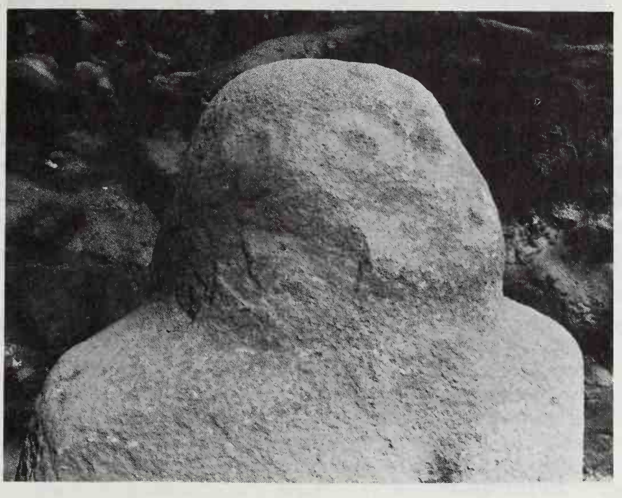

Figure 12. Abaj Takalik Monument 40, showing surviving details of earlier carving.

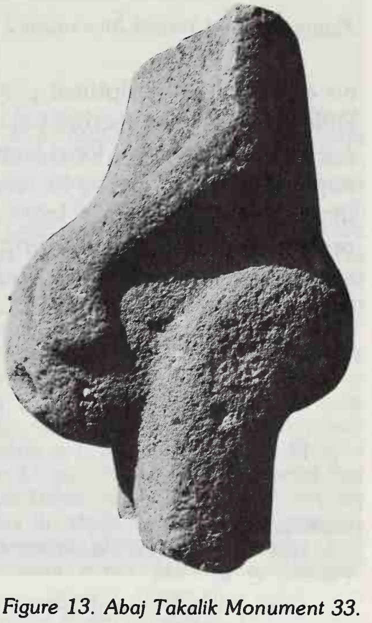

Figure 13. Abaj Takalik Monument 33.

To conclude this necessarily brief and highly compressed survey, it is reiterated that Pacific Guatemala and its immediate neighbors constitute a primary cultural region of Mesoamerica whose complex and crucially significant history is only beginning to be perceived in some of its broader outlines. The enormous corpus of sculptural art to be found within this relatively small area as well as the outstanding quality of many of the works has not been adequately recognized in syntheses of Mesoamerican cultural history. In addition, the region is unique in at least one sense:

Figure 14. Abaj Takalik Monument 1.

Figure 15. Sin Cabezas Sculpture 1.

no other major sculptural province possesses such a diversity of significant artistic styles. Among the factors partly accounting for the sculptural significance of the area are the abundance of local stone readily at hand for experimentation and working, the apparently very lengthy history of sculptural art in the region, and perhaps the strategic cultural crossroads location and environmentally rich natural setting. For the present at least, it is the first region of Mesoamerica in which a likely sequence of sculptural development is present which extends from the very beginnings of monumental stone carving through the emergence of one of the most famous sculptural styles, the Olmec.

—1981

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Notes

1. This count of the "heartland" monumental corpus omits "plain" monuments, "blanks," drain stones, unmodified natural basalt columns, and similar objects which at times have been accorded monument numbers. By definition, figurines, celts, and similar miniature carvings are naturally excluded; and as in any individual assessment, my count includes pieces some colleagues would consider non-Olmec while excluding others that some might consider to be within Olmec style. Illustrating the confusions with which students must contend, there are three La Venta sculptures which have each received no less than four separate catalogue designations while certain other "La Venta" monuments do not derive from the La Venta site. The invaluable and admirable guide to Olmec sculpture of the "heartland" by Beatriz de la Fuente (1973) is an indispensable index, but even de la Fuente and her associates were unable to sort out all the duplicating and misleading references and terminology for a number of monuments.

   The general problems of archaeological methodologies in the dating of sculptures in Mesoamerica is considered in detail in a paper in preparation. I would here note only that the problems, in part, involve distinguishing dating of creation, and sometimes re-carving, from the dating of subsequent uses, the possibilities of more recent sculptures being found in seemingly older contexts versus the very common occurrence of ancient sculptures in more recent contexts. Bearing upon the question of the dating of the first appearance of a developed Olmec sculptural style, Coe and Diehl (1980) assert their belief that at San Lorenzo, in striking contrast to La Venta, a number of major Olmec sculptures were not only not re-used during the subsequent three millennia of the site's history (in which various later occupations have been documented, including a Villa Alta phase of terminal first millennium A.D. age which equalled or exceeded the San Lorenzo phase in its magnitude) but were, in fact, permanently "buried" by about 900 B.C. The still earlier genesis or emergence of a clearly definable Olmec style required by the Coe and Diehl interpretation raises serious problems of interpretation and credibility. For instance, since there are substantial reasons to believe that Olmec style sculpture and Olmec influenced or related art were being produced at much later dates within currently accepted chronologies, the relatively small present corpus of Olmec work exhibiting little profound evidence of substantial, long-term change and evolution through time, requires a stylistic duration difficult to believe, but perhaps not impossible to accept.

   Among the many instructive comparisons to be examined between Olmec art of the "heartland" and sculptural art occurring elsewhere is the case of La Venta Monument 19 and Kaminaljuyu Stela 11. While the Kaminaljuyu carving has often, and astonishingly, been termed "Izapan," its formal properties, despite its fundamentally Maya conception, are so clearly tied to La Venta Monument 19 that a significant historical relationship cannot be doubted. La Venta Monument 19 is most probably later than the earliest examples of Olmec style and Kaminaljuyu Stela 11 may well be earlier than its final repositioning in the Miraflores context within which it was discovered; this would allow narrowing of

temporal separation in terms of conventional chronologies. The Olmec relief (termed "Izapan" by Clewlow 1974:134) of Abaj Takalik Monument 1 parallels Cerro de las Mesas Stela 9 and illustrates a more perplexing tie for traditionally held chronological schemes. The parallels between many early, and even later, Maya works and Olmec carvings further points to significant chronological and stylistic overlaps.

2. On the other hand, three of the four important Olmec carvings in the round from Sin Cabezas, Escuintla, were published thirty years ago (Shook 1950). These carvings are all fine examples of Olmec sculpture while the better preserved Sculpture 1 (Fig. 15) is an exceptionally outstanding work; had it been uncovered at La Venta, one can be certain it would have been illustrated frequently as one of the masterpieces of Olmec carving in the round. Nevertheless, neither of the two articles treating Olmec sculpture and its style in the *Handbook of Middle American Indians* (Volume 3) mentions the Sin Cabezas sculptures although the less impressive Olmec reliefs from Las Victorias, Chalchuapa, El Salvador, and San Isidro Piedra Parada (Abaj Takalik Monument 1), Retalhuleu, Guatemala, situated to either side of Sin Cabezas are both cited. Considering the importance of the Sin Cabezas carvings, I might note that two rather similar pieces now in the Popol Vuh Museum, Guatemala, are, in my opinion, of most dubious authenticity while a third example, in a private collection and *con cabeza*, is not directly comparable stylistically (cf. Parsons 1981:270-271, Fig. 12).

   The designation of "Pacific Guatemala" is employed broadly and without strict restriction to current political frontiers.

3. Preliminary accounts of recent work at Abaj Takalik and a plan of a small section of the ruins, largely deriving from the first season's exploratory investigations (1976), may be found in Graham 1977, 1979, and Graham, Heizer, and Shook 1978. Work at Abaj Takalik by the University of California, Berkeley, has been faithfully supported by the National Geographic Society together with the generosity and keen interest of John Clark, of Marriottsville, Maryland; William Parady, of Farmington, Connecticut; and Francesca Wiig, of Antigua, Guatemala. The requisite authorizations, valued cooperation, and intellectual stimulation of Guatemalan authorities, colleagues, and friends are most warmly acknowledged.

   For a selection of some additional Olmec material recently published from the area and from neighboring Chiapas, see Shook and Heizer 1976; Milbraith 1979; Navarrete 1974; McDonald 1977.

4. E.g. "Olmec figures are especially notable for their dynamic quality, almost invariably striding, crouching, kneeling, leaping" (Stirling 1965:721).

5. Whether the commonly employed "11.16.0.0.0" correlation of Maya and Gregorian calendars is correct, there seems no reason to suspect that the calendrical dates inscribed on the Maya style monuments of Abaj Takalik belong to a different calendrical reckoning from that found in the Maya lowlands to the north during the first millennium A.D. The Abaj Takalik hieroglyphic dates satisfactorily relate these Maya sculptures vis-à-vis the earliest hieroglyphically dated Maya sculptures now known in the lowlands to the north and to which the Abaj Takalik carvings are clearly antecedent.

   Of course, a number of objects in Olmec style, particularly jades, possess Maya hieroglyphic texts; these have usually been interpreted as subsequent additions. The famous Olmec relief Stela C of Tres Zapotes with its Maya style Initial Series date and Maya glyphic text is paralleled at Abaj Takalik in Stela 50, a badly mutilated Olmec niche sculpture with a Maya style bar and dot Initial Series on the reverse and presumably added in later times.

6. The interpretation of some boulder sculpture as antecedent to Olmec style was advanced by the late S. W. Miles (1965) in the first and to date only broad attempt to synthesize the sculptural history of Pacific and highland Guatemala and Chiapas. Her study was extremely insightful in many respects, deserving far more serious attention than it was accorded in its time. It is now necessary, of course, to revise substantially much of Miles' sequence as the increasingly complex history of the area is gradually coming to light.

   Although potbelly boulder sculptures were still being reset in very late pre-Columbian times, no student today familiar with the archaeology of Pacific Guatemala disputes the carving of these monuments as early as the middle to late centuries of the first millennium B.C. Some students, however, have believed the sculptures to be derivative and provincial to Olmec style, holding that their age of creation was synchronous with the age of placements in the archaeological contexts of this period at certain sites. These views can no longer be considered plausible in the context of the archaeological remains at Abaj Takalik.

13

Settlement and Cultural Development at Chalcatzingo

by David C. Grove, Kenneth G. Hirth, David E. Bugé, Ann M. Cyphers

Some of the earliest developments of social stratification and complex religious practices in Mesoamerica can be traced to the Olmec culture that existed on Mexico's southern Gulf Coast from about 1150 to 550 B.C. Possibly due to a belief that complex cultures cannot arise in tropical environments, some scholars have attributed Olmec origins to other regions and other cultures; however, the pre-Olmec stratigraphic sequence recently uncovered at San Lorenzo[1] suggests that Olmec cultural development is basically indigenous to the Gulf Coast region. Other new data indicate that we must not credit Olmec culture alone for developments in social and religious complexity early in the Formative period. Parallel developments may have taken place at least as early in Oaxaca, Chiapas, and possibly even western Mexico.[2] By 1150 B.C., however, stylistic motifs that many scholars identify as Olmec were used on ceramics in widespread areas of Mesoamerica, and by 900 B.C. both portable and monumental Olmec-style stone art could be found in areas far distant from the Olmec heartland on the Gulf Coast. The actual nature of this cultural diffusion and the manner of its acceptance in other regions is still unclear and raises a number of questions. For instance, was cultural development in these other regions stimulated or influenced by Olmec culture?

In this article we discuss research conducted at a major Formative period archeological site in highland central Mexico—Chalcatzingo (Fig. 1).[3] While investigating cultural development in the highlands was one goal, the research project also studied external influences on this region, particularly Olmec influences. Chalcatzingo, which is about 120 kilometers southeast of Mexico City, is the only archaeological site in Mexico's central plateau known to have Olmec-style bas-relief carvings. Our

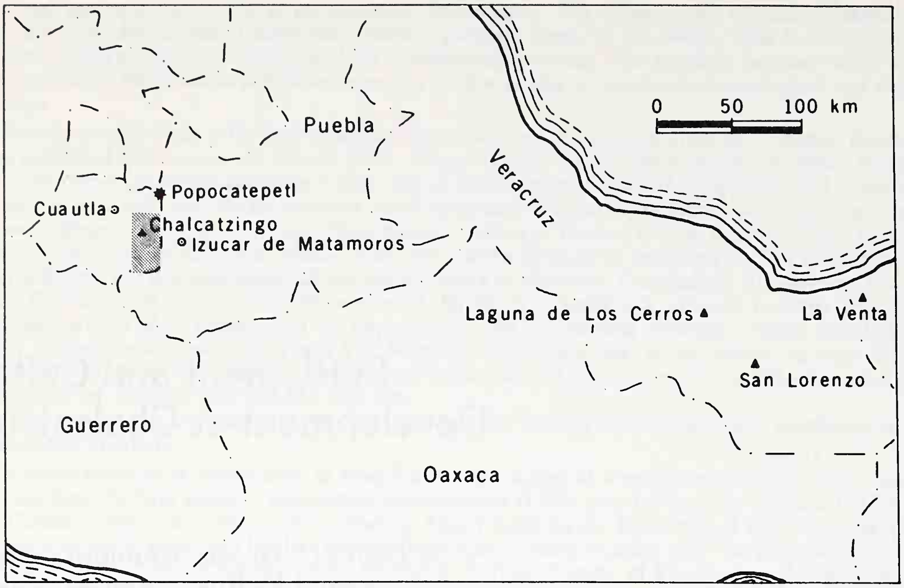


Figure 1. Central Mexico. Chalcatzingo and Gulf Coast sites are indicated by [▲]; shaded area is the project's survey area.

research, begun in 1972, was carried out as a cooperative project of the University of Illinois and Mexico's Instituto Nacional de Antropología e Historia. The investigations included determination of the archeological chronology at the site, the basic culture pattern, site size, housing, ceremonialism (as expressed in architecture and ceramics), and patterns of social stratification, subsistence, and craft production. Ecological research included intensive palynological studies of all major excavation units and analyses of land-use practices and strategies, water control systems, vegetation zones, and modern crops and yields. A further step was to consider Chalcatzingo in terms of its immediate sphere of social and economic interaction. For reasons of geographical constraints and ancient and modern settlements, we defined this area of local interaction as the Amatzinac-Tenango River valley. Chalcatzingo is near the center of this valley (Fig. 2). An intensive surface reconnaissance covering more than 500 square kilometers of the area was undertaken and all pre-Hispanic sites were mapped and sampled. Later, as the settlement patterns became clearer and as hierarchical patterning emerged from the data on Formative period sites, several minor sites within the survey area were excavated for comparative data.

At the time our research was begun, speculation regarding Chalcatzingo was already highly developed. No Formative period ceremonial architecture was known to exist at the site, which suggested to some investigators that it had functioned as a religious shrine before the development of the Olmec sites with architecture on the Gulf Coast.[4] Other archeologists saw Chalcatzingo as an Olmec colony, an Olmec outpost, or a trade control center linking the highlands with the Gulf Coast.[5-7] Among other things, our research served to test these hypotheses. We present a brief overview of the research results, together with tentative conclusions that we have reached on the basis of our analyses to date.

Geography

The Amatzinac-Tenango River flows along the alluvial plains extending south-

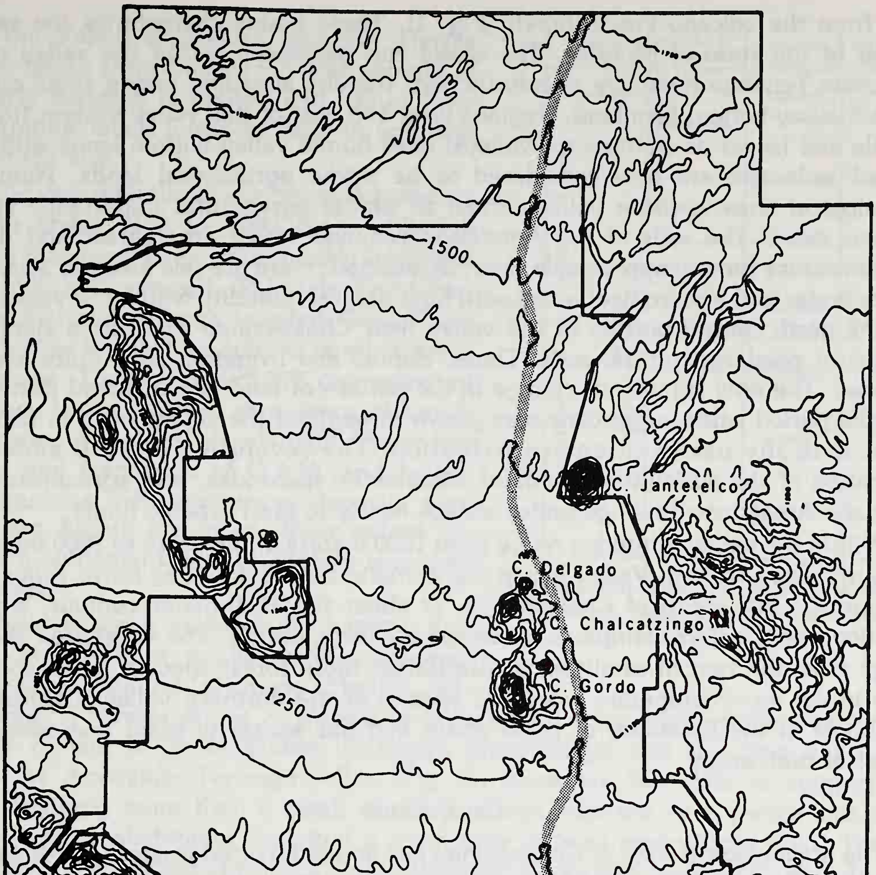


Figure 2. The Amatzinac-Tenango valley survey area. Shaded area is the Amatzinac-Tenango River.

ward from the volcano Popocatepetl (Fig. 1). These plains characterize the eastern quarter of the state of Morelos. The rivers and barrancas within the valley of the Amatzinac-Tenango River are deeply incised, thereby affording only a small amount of good valley-bottom farmland. Regions west and east of this valley system (the Rio Cuautla and Izucar de Matamoros valleys) have humid valley-bottom lands with finer grained soils and are now considered to be prime agricultural lands. Numerous archeological sites in those valleys attest to similar agricultural importance in pre-Hispanic times. The soils of the Amatzinac-Tenango valley are coarser and do not retain moisture for any appreciable time. In addition, there are few areas of accessible surface water and a scarcity of areas with high natural humidity within the valley. It is only the north central portion of the valley near Chalcatzingo that has a significant expanse of good agricultural soils. There, rainfall and irrigation agriculture are now practiced. The only significant change in the pattern of land use occurred during the hacienda period when sugar cane was grown throughout the valley, even in marginal areas, with the use of intensive irrigation. The revolution of 1910 ended the domination of the agricultural lands of Morelos by haciendas, and agricultural land use in the Amatzinac-Tenango valley shrank nearly to pre-Hispanic limits.

Within the valley, altitudes range from 1600 meters in the north to 1000 meters in the south. The southern Valley lies in the climatic zone defined as *tierra caliente*, or hot country. Just south of Chalcatzingo, at about the 1250-meter contour, a major transition into the *tierra templada*, or temperate zone, occurs. The vegetation shows a change from the typical semitropical Rio Balsas thorn forest species of the southern valley to the more temperate woodland species of the northern valley. Chalcatzingo lies almost at the boundary of these zones and has access to plant and animal resources of both areas.

Excavations

The archeological zone at Chalcatzingo lies on the terraced western hillside of two large granodiorite peaks whose bare cliff faces tower 300 meters above the site. At the foot of the hillside is a small permanent spring and stream. The peaks, Cerro Delgado and Cerro Chalcatzingo, are the central group of three such imposing mountains that rise from the flat valley floor and are visible from many areas of Morelos (Fig. 2). The majority of the Formative period ceremonial and occupation areas occurs on the western hillside, but farming and habitation extended onto the eastern hillside as well. This eastern area, now called Tetla, contains Classic and Postclassic architectural remains, including pyramid mounds and a ball court.

The Chalcatzingo research has defined three major cultural phases covering more than a millennium of occupation during the Early and Middle Formative periods. The placement of these phases within an absolute time frame is aided by almost 50 radiocarbon dates. Our laboratory work is still refining our phasing and subphasing. Accordingly, we consider the following divisions as tentative and have given them only letter designations rather than names: phase A (Early Formative, 1600 to 1000 B.C.); phase B (early Middle Formative, 1000 to 750 B.C.); and phase C (late Middle Formative, 750 to 550 B.C.) (Fig. 3). A minor Late Formative occupation as well as Classic and Postclassic occupations at the site are not discussed in this article.

Radiocarbon dates place the earliest occupation at Chalcatzingo at around 1600 B.C. The settlement, a small farming hamlet, was situated on the natural, unmodified hillside. The earliest phase A ceramics are characterized by hemispherical bowls, bowls with incurved rims, and ollas with flaring necks. Decoration is limited to simple red painted designs. These early ceramics are similar to those of the Nevada phase

from the Valley of Mexico and the Tierras Largas phase from Oaxaca.[2,8] Our sample of the early material is limited and comes from stratigraphic levels 5 meters deep in only one area of the site.

The vast majority of our phase A ceramics date to about 1150 to 1000 B.C., although the site may have been continuously inhabited from 1600 B.C. onward. This late Early Formative material belongs to what Grove[9] has described as the Tlatilco culture in other areas of Morelos. These ceramics are characterized by red-on-brown sherds, abundance of brown plainwares, occasional sherds with Olmec-like motifs, and fragments of D.2.K, and hollow D-K figurines. Although these deposits generally are highly disturbed, their extent indicates a settlement area of slightly less than 2 hectares.

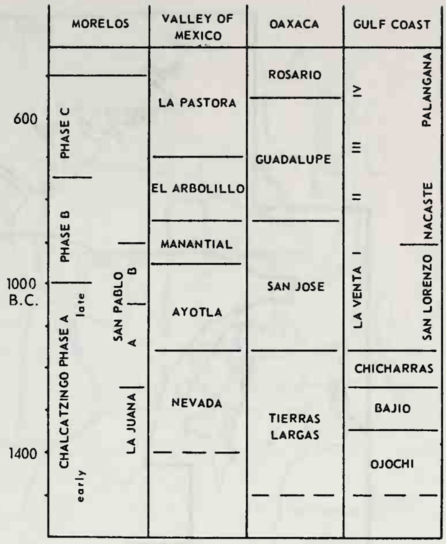


Figure 3. Chronological sequence for central Mexico, Oaxaca, and the Gulf Coast.

There is some evidence to suggest that minor ceremonial or public architecture may have been a feature of many Tlatilco culture sites;[10] several phase A structures covered by later architectural features on the site remain to be excavated. Although Chalcatzingo was the largest phase A site in the Amatzinac-Tenango valley (Fig. 4), there are few data to suggest that it was anything more than a small farming village adjacent to a permanent water supply, whose inhabitants exploited a small area of good agricultural land. The low quantity of decorated ceramics, including red-on-brown bottles or sherds with iconography of the Olmec type, suggests that Chalcatzingo was marginal to the mainstream of Tlatilco culture and had no significant interaction with the Gulf Coast. Ceramic similarities shared with the Izucar de Matamoros region do suggest significant interaction with that area.

At about 1000 B.C., a series of major changes began at Chalcatzingo. These seem to reflect local, regional, and almost pan-Mesoamerican reorganization of the sociopolitical and economic spheres. Palynological data show a period of intensive environmental modification at Chalcatzingo, with removal of trees and disturbance of the landscape. It is likely that these are the first attempts to modify the local environment to better suit cultural needs. Chalcatzingo grew in surface area, population, and regional importance at this time. Monumental public architecture was constructed and other public works carried out. The entire hillside was terraced to provide increased space for habitation and agricultural needs (Fig. 5). This terracing was planned and executed in such a way that rainwater runoff from the hills and site was channeled across the site, slowed by diversion dams, and redirected to prevent the destruction of the prime agricultural lands at the foot of the site. The diversion dams, one of which is 35 meters long and 7 meters high, are still effective in preventing erosion and the system is maintained today by the farmers who plant the terraces.

The occupation and ceremonial area at Chalcatzingo during the early Middle-Formative (phase B) covered a minimum area of 20 hectares. The major feature on the site at that time may have been the long earthen platform mound built along the northern (downhill) edge of the site's uppermost major terrace (the "Plaza Central")

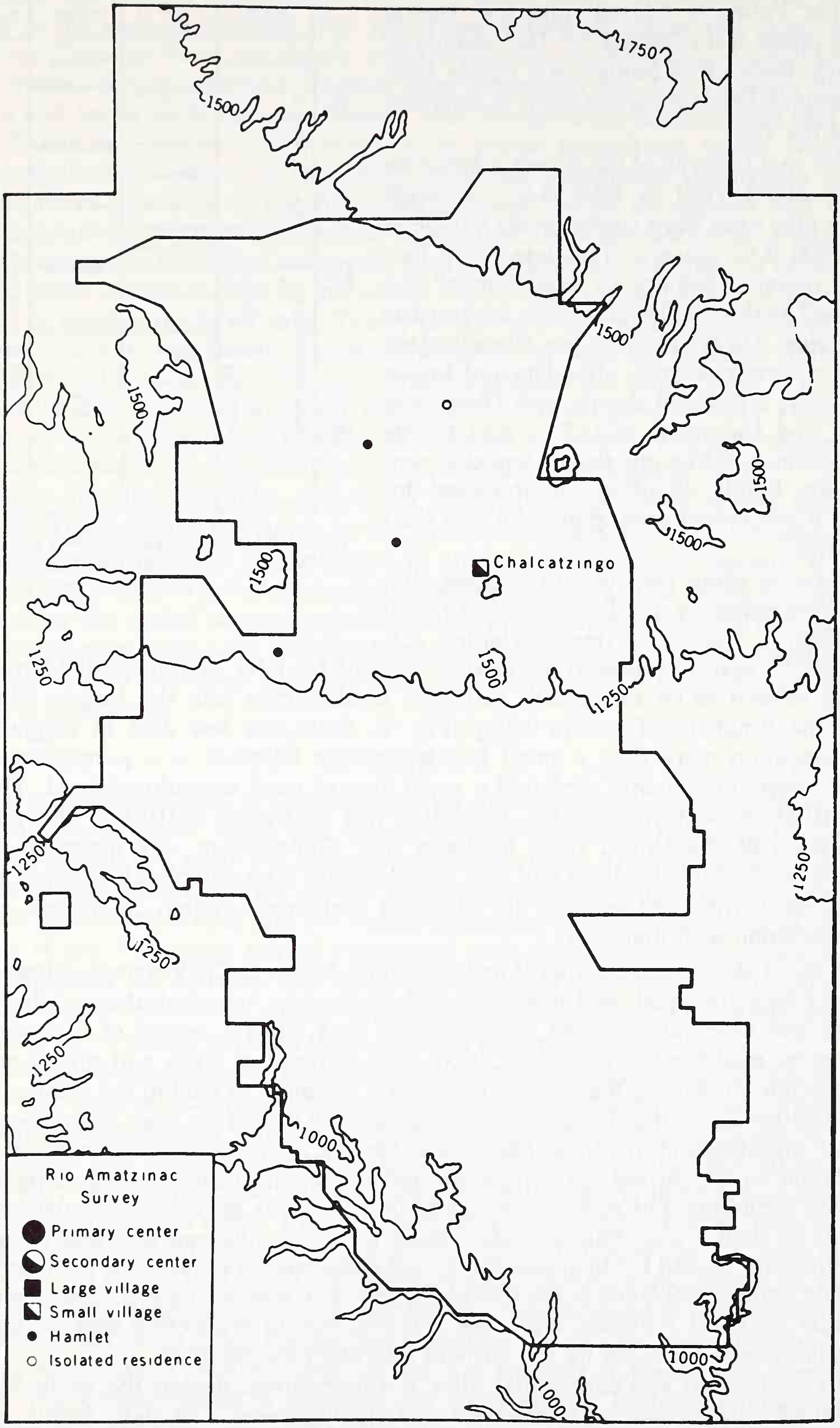
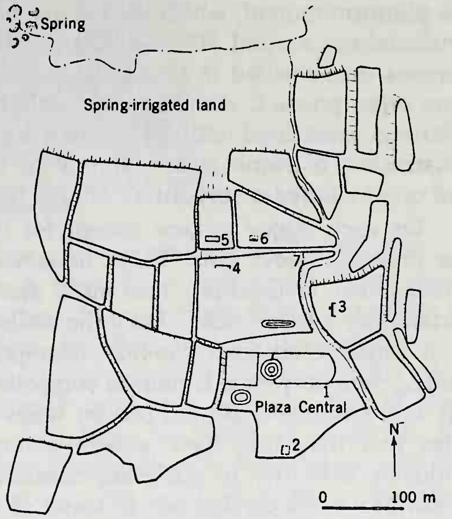


Figure 4. Settlements of the Early Formative period.

Figure 5. The main site area at Chalcatzingo with terraces and major features: 1. earthen platform mound; 2, elite residence; 3, stone-faced platform mound with stela in situ; 4 and 5, stone-faced platform mound; 6, altar; and 7, diversion dam.



(Fig. 5). The Plaza Central terrace also lies adjacent to the major group of bas-relief carvings. The platform mound is 70 meters long, 40 meters wide, and possibly had a height of almost 4 meters above the original terrace surface. In addition to the platform mound, our excavations uncovered phase B structures in the Plaza Central, at least one of which can be classified as ceremonial architecture. The platform mound and the phase B structures indicate a ceremonial function for this terrace during the early Middle Formative.

Phase B ceramics are similar to ceramics of the Manantial phase in the Valley of Mexico.[8] Whiteware bowls with the double line-break rim motif and pseudo-grater bottom interiors are characteristic. Bowl bases are primarily flat although occasionally slightly rounded. An important ware is the so-called lacquer ware, or *laca*, which is usually orange although differences in slips and firing technique also created brown, red, and yellow *laca* wares. The C.2, C.3, and C.5 figurines are typical of this phase. Computerized analysis[11] indicates that C.2 figurines occur primarily in the non-cermonial or nonelite site areas, while the reverse is true for C.3 and C.5 types.

Our greatest quantity of archeological data relates to the late Middle Formative phase C occupation. At that time, Chalcatzingo reached its peak of development in terms of social and political complexity and overall size. The phase C site covered a minimum area of 25 hectares, not including the settlement areas on the north and east sides of the Cerro Delgado and the small scattered occupation areas near the spring. Two developments point to increased ceremonial activity. Stone-faced platform structures, about 18 meters long and up to 2 meters high and 5 meters wide, were constructed on three separate terraces north of the Plaza Central (Fig. 5). They increase the area we can define as having had ceremonial functions from 1 to nearly 6 hectares. A broken stone stela was found in situ in front of one of these platform structures. The Plaza Central's platform mound continued in use and a series of structures resembling houses was built along the terrace's south side. Artifact assemblages from these structures suggest that, with one exception, they served ritual, ceremonial, and, possibly, workshop purposes.

The single exception is a structure, located directly across the Plaza Central from

the platform mound, which we believe was the single elite or high status residence at Chalcatzingo around 700 to 600 B.C. Its location and uniqueness suggest that the persons who resided in this structure held the prime authority at the site. It differs from other phase C dwellings in its slightly larger size, its location, and in the richer offerings associated with its subfloor burials. Seven burials occurred in crypts (cists) constructed of stone slabs. Several of these crypt burials included jade ornaments, and one included a serpentine Olmec figurine.

On each major terrace except for those with ceremonial constructions, there is one phase C house unit. These houses average nearly 8 by 10 meters in size. Their construction is unusual; the walls along the length of the house were made of rectangular adobe bricks, while the walls along the width of the house appear to have been constructed from *chamiza* (Compositae) stalks covered with mud plaster. Our limited data on phase B houses suggests that they were also of this approximate size but with *chamiza* and mud plaster walls only. The large floor area of all houses indicates that they may have served extended family groups. Evidence suggests that workshop activities in obsidian, hematite (grinding for pigment), and, occasionally, serpentine were carried out in some of the houses. With the exception of the Plaza Central elite house structure, sub-floor burials in phase C houses occur with only ceramic vessel offerings. Burials in crypts or associated with jade are absent in the houses.

Phase C ceramics are different than previous ceramics in form and design motifs, and new ceramic types appear among the artifacts. Whitewares are diminished in both quantity and quality. Bowls with pseudo-grater bottom interiors are no longer found and bowl bases are rounder and deeper. Bowl walls are often widely flaring. *Laca* wares also decline sharply in quantity, while a new orange slipped ware appears. This ware, which we call Peralta Orange, is characterized by composite silhouette bowls and narrow-necked ollas generally decorated with linear punctuation. Our data indicate that Peralta Orange wares may be restricted in distribution to Amatzinac-Tenango valley sites. Polychrome wares characterized by red and black designs on a white background (occasionally red, black, brown, and orange on white) also occur during phase C. These polychromes appear in greatest abundance at Chalcatzingo and within the valley; small quantities have been found at one other Morelos site but they are virtually unknown in sites of the Valley of Mexico.[12]

For either B or C phases it is difficult to associate the ceramics and figurines at Chalcatzingo to any significant degree with types known from the Gulf Coast. Phase C ceramics are most closely similar to those of the El Arbolillo and La Pastora subphases of the Valley of Mexico. During phase C the Chalcatzingo figurines and ceramics took on an individuality of their own and no longer completely mirrored general highland styles. In addition, the distribution of specific figurines and ceramics on the site supports other archeological data indicating increased ceremonial activity during phase C.

If one figurine type can be stated to be relatively restricted to Chalcatzingo and the surrounding valley, it is the C.8 type. This type (Fig. 6) is far more naturalistic than the majority of highland Middle Formative figurines and is often finished with a highly burnished orange slip, a treatment lacking in other figurines. These C.8 figurines are rarely found at Valley of Mexico sites but appear in quantity at Chalcatzingo and are a phase C marker. They also occur in the Izucar de Matamoros valley to the east.[13] Their presence in both areas may serve to delimit a major sphere of interaction during the late Middle Formative (similar interaction was noted for phase A as well).

Figure 6. Figurine heads of the C.8 type. Each head is 4 to 5 centimeters tall.

In 1973, excavations on the second terrace north of the Plaza Central (Fig. 5) disclosed a large stone altar, identical in form to those from Gulf Coast Olmec sites. The altar, some 4 meters long, 2 meters wide, and 1 meter high, is the only altar of Olmec style ever found outside of the Gulf Coast. It differs from Gulf Coast altars in only one major respect. While each Gulf Coast altar is carved from a monolithic stone block weighing many tons, the Chalcatzingo altar is constructed of more than 18 large stone blocks, despite the fact that suitable monolithic boulders occur within 100 meters of the altar's location. This suggests that Chalcatzingo's interactions with the Gulf Coast were such that the construction of an altar was appropriate, but loose enough that Gulf Coast artistic conventions were not strictly adhered to.

The altar sits on the south side of a low walled patio area of about 50 square meters. More than 20 burials were uncovered in this patio area, including three within the altar's earthen core and a child burial at the altar's east front corner. The altar is built atop a thin layer of phase C deposits, and the ceramics and radiocarbon dates also place the patio and altar burials as phase C. Because it has been reassembled incorrectly, we know the altar was dismantled and reassembled during its history. Therefore, its original construction could have taken place during phase B. Such an explanation could account for the apparent time gap between Gulf Coast examples and the Chalcatzingo altar.[14]

The problem of chronological placement of the altar illustrates the problem of a time frame for Chalcatzingo's bas-relief carvings as well, for in most instances they occur in areas of high erosion and our excavations were unable to recover datable materials associated with the reliefs. We believe that, stylistically, the reliefs show strongest similarities to the carved stone art of La Venta and, in particular, La Venta's stelae. This suggests a phase B and C placement. At least a dozen new reliefs and monuments, including stone stelae, were uncovered during our excavations. Several show such striking similarities to the art of La Venta that the person (or persons) responsible for the execution of these carvings obviously was intimately familiar with La Venta's art. An example of this is the relief carving, found during our 1972 field season, which we call the *volador* or "flying Olmec" relief (Fig. 7). The person depicted flies through the air carrying a torch in his right hand. Identical flying figures bearing torches appear on Gulf Coast jades,[6, 15] and the Chalcatzingo figure's pose and dress almost mirror those of figures carved on the upper portion of La Venta's Stela 3 (Figure 68 in note 6). There is no tradition of rock carving in the highlands prior to its appearance at Chalcatzingo, which means that it was imported as an already developed art form. However, while much of the iconography can be linked directly to Gulf Coast art, there are other characteristics of the bas-relief art that seem unique to Chalcatzingo and possibly represent highland religious concepts or a syncretism of highland and Gulf Coast beliefs.

Site Alignment

Although site alignments are frequently given by investigators, the actual signi-

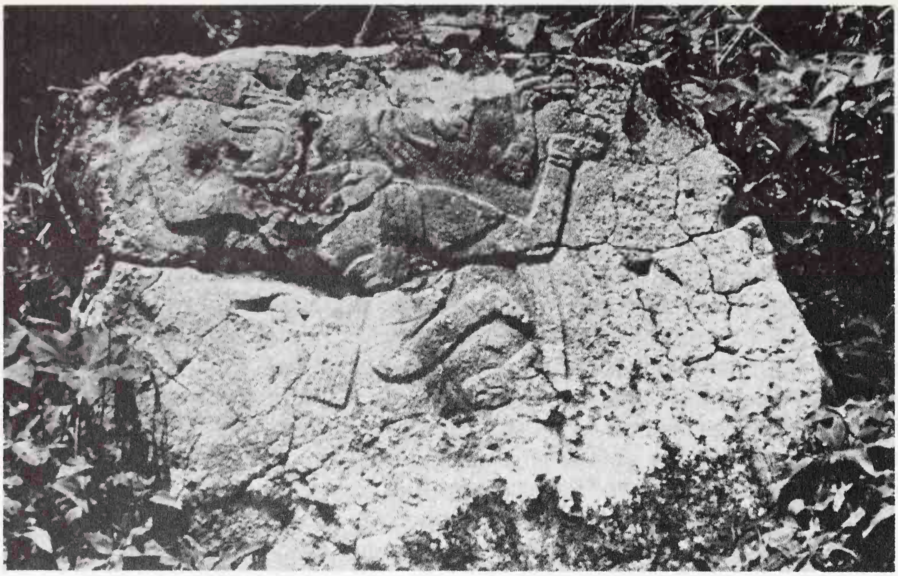


Figure 7. The "flying Olmec" bas-relief carving. The rock face is 1.35 meters wide.

ficance of these during the Formative period is still a matter for debate. While usually attributed to astronomical orientations, alignments do vary through time, even at the same site. The use of a lodestone compass was recently suggested as having been used for Olmec site alignment and Chalcatzingo's inclusion within the Gulf Coast site alignment pattern was inferred.[16] Our data disagree. The major alignment at La Venta and Laguna de los Cerros, both apparently contemporaneous with Middle Formative Chalcatzingo, is 8° west of true north. Although it is incorrectly drawn on some maps,[17] the Stirling group at La Venta has an orientation of 7° east of true north. Unfortunately, the temporal position of the Stirling group is unclear. The earthen platform mound on the Plaza Central at Chalcatzingo has an alignment of 1° to 2° east of true north. Phase C structures and monuments align from 2° to 5° east of true north. Archaeomagnetic samples from phase C, radiocarbon dated to about 600 B.C., indicate that, at that time, magnetic north was 5.6° $\pm$ 4° east of true north.[18] The difference in magnetic declination between central Mexico and the Gulf Coast is only about 2°. Thus, Chalcatzingo does not mirror the Gulf Coast alignment pattern or confirm the use of a lodestone compass.

Exploitation of Raw Materials

A number of raw materials apparently used in craft production and, in one case, possibly, food production were found during our excavations. These include iron ore fragments (mainly hematite), jadeite and other green stone, obsidian, lime, and kaolin. Some iron ore pieces with grinding marks were apparently used in making hematite pigment. Several others were highly polished as mirrors, and one concave hematite mirror was found with a phase C high status burial. We believe that much of the iron ore used at Chalcatzingo (at least for grinding hematite pigment) is local and was derived from sources under Chalcatzingo's control.[19] Iron sources along the western edge of the Amatzinac-Tenango valley, exploited by the Spanish soon after the conquest, are currently under our investigation.

Similar investigations are being conducted on kaolin clay. Our data suggest that Chalcatzingo and many of the smaller Middle Formative centers in the valley manu-

factured their own ceramics from local clays. X-ray diffraction tests conducted by us[20] show that the white slip used in the manufacture of whitewares is kaolin, a clay that has restricted distribution and is relatively rare. Whitewares are important and abundant throughout much of northern Mesoamerica during the Middle Formative, and it is our impression (not yet confirmed by exhaustive tests) that kaolin is the white slip on many, if not most, Middle Formative whitewares. This would mean that whitewares could not have been manufactured unless kaolin was a significant item in the trade and exchange networks. It is relevant that Chalcatzingo is located adjacent to several kaolin sources that are the only sources in Morelos and some of the few in the entire central highlands.[21]

Although lime plaster was used on public architecture in Early Formative Oaxaca,[2] the use of lime in central Mexico is generally regarded as beginning with the Classic period. However, excavations of a phase C structure at Chalcatzingo disclosed a large deposit of lime overlain by several phase C burials. The nearest limestone sources occur about 4 kilometers to the west. The lime does not appear to have been used as plaster or paint and therefore may have been used in preparing corn for *masa*. A few *comal*- (griddle) like plates with roughened bases, of the type normally associated with tortilla making, occur as early as phase B; however, this is certainly not definitive evidence of tortillas in the Middle Formative period.

No source analyses have been carried out on jadeite by any project, partially because of the reluctance of museums and others to permit such analyses. Therefore, little can be said as yet about jadeite exchange networks in Mesoamerica. Preliminary studies[22] suggest that some jadeite beads found with high status burials at Chalcatzingo come from sources that also supplied La Venta, and that serpentine artifacts were manufactured on the site.

Regional Settlement

Only five Early Formative sites were revealed by our intensive surface reconnaissance of the valley (Fig. 4). This quantity stands in sharp contrast to settlement density in central Morelos and the Izucar de Matamoros valley where abundant surface water and high natural humidity combine to create excellent locations for agricultural villages. Early Formative sites there appear to be spaced at almost 1-kilometer intervals along the river margins. Such areas of accessible water and high natural humidity are rare in the Amatzinac-Tenango valley and were selected for Early Formative settlements. Within the valley, the phase A population density was apparently quite low, probably not in excess of 500 people. Chalcatzingo, the largest settlement, was small in relation to sites in central Morelos.

As mentioned above, Chalcatzingo was apparently marginal, both geographically and culturally, to the Tlatilco culture sphere. Our reconstruction on the basis of archeological data is that the Tlatilco culture sphere was composed of a series of loosely structured groupings of politically autonomous agricultural villages. The network of villages was bound together in a simple hierarchial arrangement, with ties relating primarily to the exchange and redistribution of both utilitarian and exotic raw materials. As the only village-size settlement in the valley during the Early Formative, Chalcatzingo must have been the focus for redistribution and exchange in that area. Inter-regional exchange must have taken place with villages in central Morelos and, to a somewhat larger degree, with the Izucar de Matamoros valley. While the valley iron sources may have been exploited on a minor scale during the Early Formative period, the same cannot be said for the kaolin sources. Kaolin sherds, typical of many Early Formative assemblages, are extremely rare at Chalcatzingo.

A completely different picture emerges for regional population organization during the Middle Formative. Fifty-seven sites were located by our reconnaissance (Fig. 8), a tenfold increase over the number found for the Early Formative period.[23] The actual population increase must have been much greater. The initial growth of population in the valley during the Middle Formative may be linked to land and population pressures in the rich agricultural valleys of central Morelos and western Puebla, which caused movements of people into more agriculturally marginal areas including the Amatzinac-Tenango valley. The valley is marginal in terms of agriculture that is dependent on rainfall but has a high yield potential when irrigated. The hydraulic constructions at Chalcatzingo, mentioned above, attest to the existence of the necessary technology to carry out irrigation projects. Some settlement locations suggest that small-scale irrigation systems might have been used during the Middle Formative period in the valley, including at Chalcatzingo.

While the initial stages of population increase in the Middle Formative may have involved land and population pressures in nearby areas, there is little doubt that eventually Chalcatzingo itself provided attractions. The settlement data illustrate that villages and hamlets nucleated around Chalcatzingo during the Middle Formative (Fig. 8); possibly 50 percent of the valley's population was congregated within a 6-kilometer radius of the site. We believe that this nucleation occurred for socioeconomic reasons. Chalcatzingo was certainly a craft production and commodity redistribution center for the valley (and probably for a much larger region as well). The nucleation of villages around this primary center, a phenomenon not seen in the data from other areas of the highlands of the same period, suggests a change from a redistributive economy to an incipient solar market economy of the type characteristic of the highlands in later culture periods.

Not only did Chalcatzingo dominate its regional economy, but its size, its bas-relief carvings, and its place within the regional settlement pattern suggest that it was probably the major Middle Formative site in the central highlands. It may also be the earliest formal ceremonial center with monumental architecture in this area.

Conclusions

There seems little reason to believe that an important center such as Chalcatzingo would arise in a marginal agricultural area without other, nonagricultural stimuli. Early Formative Chalcatzingo may have been small and marginal, but its early role in the redistribution of resources within the valley and its access to valuable resources such as iron ore and kaolin proved to be significant during the Middle Formative. With increasing population throughout central Mexico, Chalcatzingo's role, in both the exploitation of local resources and the redistribution of these and imported commodities grew. With commodities such as kaolin and hematite in increasing local and regional demand, Chalcatzingo emerged as an important hub of Middle Formative commerce.

There is little actual evidence of direct trade between the Gulf Coast and the highlands in the Early Formative. Early Formative exchange may have been indirect, conducted through a series of intermediaries. This pattern seems to have undergone change by 900 B.C. We believe that among the changes which occurred at Gulf Coast sites was the formalization of the economic networks through which the Gulf Coast received utilitarian and status commodities. This appears to have involved the establishment of more direct and secure ties with key resource areas, including the highlands. This was probably brought about as stratified society, with the concomitant need for status goods, developed throughout northern Mesoamerica. The supply of

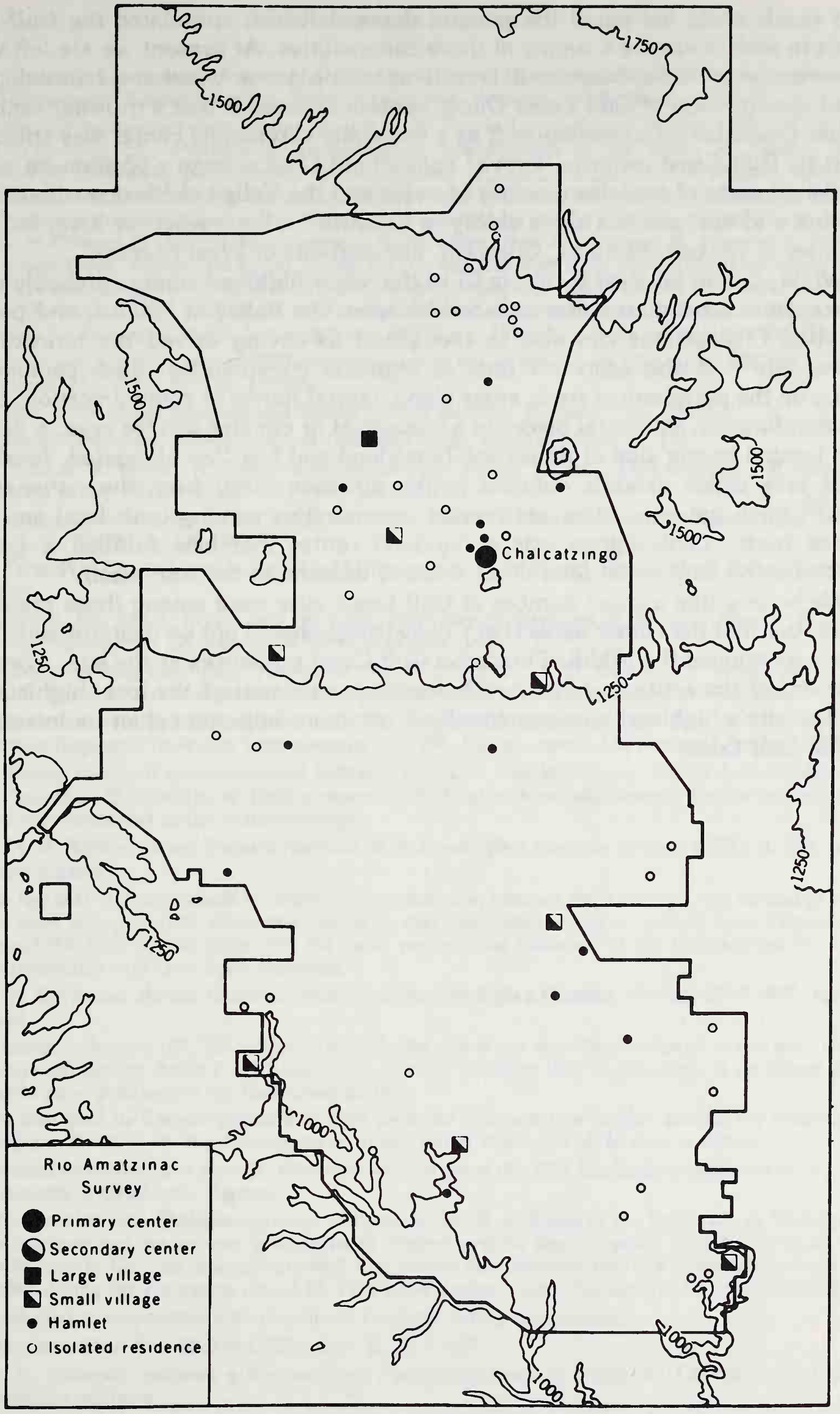


Figure 8. Settlements of the Middle Formative period.

status goods could not equal the general demand, which stimulated the Gulf Coast centers to seek to ensure a supply of these commodities. At present we are left with a chicken-and-egg riddle because it is still uncertain to us whether Chalcatzingo attracted the attention of Gulf Coast Olmec centers because it was a growing center, or whether Chalcatzingo's development as a trade and ceremonial center was stimulated in part by Gulf Coast contacts. Grove[7] pointed out Chalcatzingo's position on a long-established route of trade connecting Morelos and the Valley of Mexico with areas to the south and east and the site's ability to ''control'' a large resource area, including the Valley of Mexico, Morelos, Guerrero, and portions of West Mexico.

While serving (at least by phase C) as the major highland center, probably with a large regional service area that included Morelos, the Valley of Mexico, and portions of Puebla, Chalcatzingo can also be thought of as having served the function of a gateway city[24] in the eastward flow of highland commodities. Such communities develop on the periphery of trade areas along natural routes of communication. Unlike cities that function as central places in a hexagonal or circular service area, a gateway city is located to one side of its service hinterland and has ''an elongated, fanshaped service area which extends outward in the direction away from the national core area.''[25] Such gateway cities are market communities serving both local and long-distance trade. Chalcatzingo was a highland center that also fulfilled a gateway function for the Gulf Coast (and other areas of demand to the southeast).[26]

We believe that a small number of Gulf Coast elite were among those present on the site, but that the Olmec aspects of Chalcatzingo should not be overstressed. While we have mentioned the Middle Formative Gulf Coast influences at the site, more than 98 percent of the artifacts relate to Chalcatzingo as a part of the local highland culture. The site's highland role was equally if not more important than its interactions with the Gulf Coast.

—1976

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11. Figurine analysis was carried out by Dr. M. Harlan, University of New Mexico. More than 6000 figurine fragments have now been computerized [M. Harlan, thesis, University of Arizona (1975)].
12. P. Tolstoy (personal communication) indicated to D.C.G. that few, if any, sherds from his excavations at Zacatenco, El Arbolillo, or Tlatilco resemble the Chalcatzingo polychromes. Earlier published works also lack references to this distinctive type.
13. R. M. R. Robles, thesis, Escuela Nacional de Antropología e Historia, Mexico (1971), p. 369; personal communication.
14. The fact that undated monolithic altars occur at both San Lorenza and La Venta, are limited in number, and have strong stylistic similarities suggests that there altars occur at both of these Formative sites around 900 B.C. ± 100 years. For the same reasons, we believe that the Chalcatzingo altar is contemporaneous with Gulf Coast examples.
15. M. A. Cervantes, *Anales* (Instituto Nacional de Antropología e Historia, Mexico, 1967-1968). vol. 1, pp. 37-51.
16. J. Carlson, *Science* **189**, 753 (1975). Although the site is not directly mentioned in the text, the cover illustration depicts **Relief I** at Chalcatzingo, thereby implying that Chalcatzingo is an Olmec site and should be aligned within the Gulf Coast pattern.
17. The map used by Carlson [figure 2 in (16)] uses two different true norths, one for the main La Venta complex, the other for the Stirling group. A 22° rather than a 15° difference is shown.
18. Personal communication from D. Wolfman, who collected the 1972 Chalcatzingo samples for R. DuBois, University of Oklahoma, Norman.
19. Fifty samples from Chalcatzingo were analyzed by Dr. B. J. Evans of the University of Michigan, who has analyzed iron ore sources, manufactured mirrors, and the like in Oaxaca. Only two samples showed similarities to Oaxacan sources although it is known that Oaxacan iron ore commodities were widely traded during the Formative period [J. W. Pires-Ferreira, thesis, University of Michigan (1973)].
20. Conducted in cooperation with the Illinois Geologic Survey laboratories.
21. *Inst. Geol. Mex. Bol.* **40**, 260 (1923); *ibid.* **41**, 92 (1923).
22. Dr. C. Thomson received a Wenner-Gren Foundation grant to study the Chalcatzingo jadeite and serpentine artifacts.
23. At the time of the reconnaissance our ceramic analysis had not made a phase B and phase C separation in the Middle Formative, thus in the reconnaissance data we can speak only of general Middle Formative trends. All reconnaissance samples are being restudied to determine the phase B and phase C patterns.

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27. The project was under the direction of D.C.G. and codirectors J. Angulo and R. Arana. Funding was through NSF grant GS-31017 with supplementary funds in 1972 and 1973 from the National Geographic Society. K.G.H. was in charge of the reconnaissance, D.E.B. took responsibility for the ecological and palynological investigations, and A.M.C. took charge of the ceramic analyses. The cooperation of Instituto Nacional de Antropología e Historia and the work of many participants, both Mexican and American, contributed greatly to the results discussed in this article.

14

Obsidian Trade Routes in the Mayan Area

by Norman Hammond

Trace-element analysis of obsidians has been used recently in both the Middle East and Mesoamerica as a method of documenting prehistoric trade[1]. Studies have been based on a large number of determinations, and a fairly accurate picture of the temporal and spatial limits of the distribution of any one source has been elucidated. In the Mayan area centered on Guatemala and the Yucatán only a few determinations have so far been reported for the Classic Mayan civilization of the 3rd to 9th centuries A.D., but these preliminary results can be used to construct a model explaining the distribution of obsidians in the Mayan area which may be tested by further analyses.

The Mayan area is divided into three parts: a southern highland zone, a central lowland with tropical rain-forest vegetation, and a northern lowland with tropical scrub vegetation. The highlands are volcanic and possess a number of known obsidian sources; the lowlands have a sedimentary limestone geology (except for the horst of the Maya Mountains) and lack obsidian. The contrasting geology and relief of the highlands and lowlands results in different ranges of environmental niches and available resources, and trade in a variety of commodities between the two zones in prehistoric times has been demonstrated[2].

Two major sources of obsidian exploited by the Classic Maya have been identified in the highlands (Fig. 1). One is at El Chayal, 20 km northeast of Guatemala City; the other is some 50 km to the southeast at Ixtepeque-Papalhuapa, near the modern town and Classic site of Asunción Mita, the southernmost major center of the lowland-based civilization.

Analysis by x-ray fluorescence has shown that obsidians from these two sources

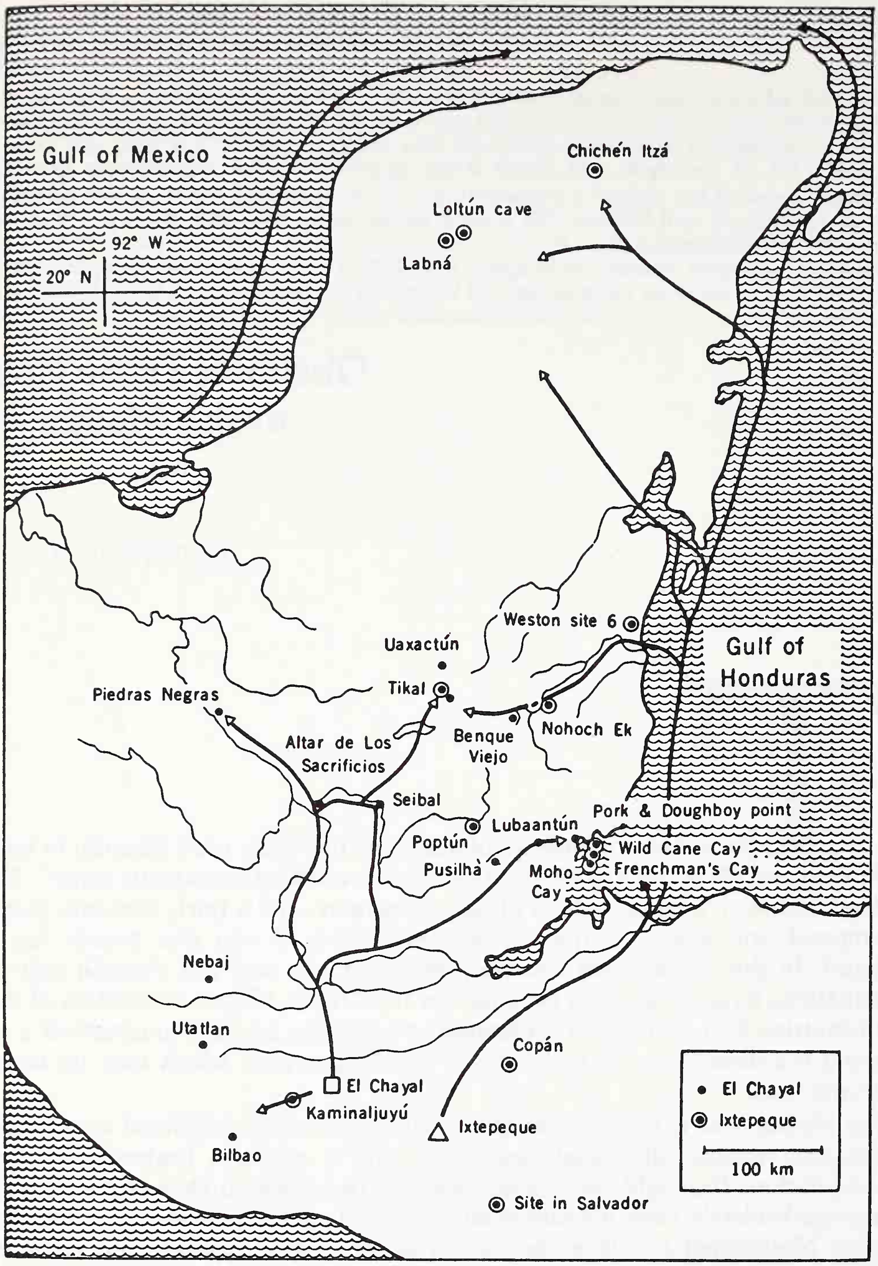

Figure 1. Archaeological distribution of El Chayal and Ixtepeque obsidians and probable major trade routes in the Mayan area.

can be characterized and differentiated, especially on the basis of their ratio of Fe to Mn and Ti to Ba, the presence or absence of Sr and Ba, and, to some extent, the relative amounts of Zr, Sr, and Rb, although this has a high noise level[3].

On the basis of such analyses of obsidians from 23 Classic period sites, it is possible to attribute the obsidian to either the El Chayal or the Ixtepeque source (Fig. 1). El Chayal obsidian is found in the highlands to the west of the source, and in the

lowlands in the Usumacinta River Basin, in northeastern Peten and the Belize Valley, and in the Toledo District of southern Belize (British Honduras). Ixtepeque obsidian is found east and north of the source (except for one sample of undated obsidian from Kaminaljuyú) along the Caribbean coast of Belize, in northeastern Peten and the Belize Valley, and in northern Yucatan.

The pattern of distribution of both sources is thus elongated northward from the source, from the volcanic highlands into the nonvolcanic lowlands where obsidian was desired for both utilitarian and ritual purposes. Lowland products were clearly sent in the other direction in exchange for obsidian and other highland goods. The exact routes involved in this trade have not been established, but evidence derived from topography, ethnohistory, and ethnography supplies a number of possibilities. Topography suggests that trade routes followed the river valleys: the Río Negro and the Río de la Pasión flow directly down to the lowlands, converging to form the Usumacinta; the Río Motagua flows northeast to the Caribbean, and the Río Grande, the Belize River, the Río Hondo, and the Sarstoon River flow from Peten east to the Caribbean.

Transport on these routes would be by porter to the head of navigation and then downstream by canoe to the sea. In Spanish documents of the early colonial period a number of overland routes are mentioned: from Chetumal Bay accross the Yucatan to Uxmal and the sites around the Puuc Hills; from Ascension Bay on the coast of Quintana Roo northwest to Chichén Itzá; and from the Toledo District of southern Belize, up into the highlands around Cajabón and Cobán, by way of the upper basins of the Sarstoon and Cajabón rivers (*2*, pp. 134-135). The use of this latter route within living memory for the cacao trade has been documented[4].

The coincidence of the trade routes which are topographically likely or historically attested with the archeological distribution of obsidians is striking, and suggests that El Chayal obsidian reached the lowlands by inland routes through the Usumacinta and Sarstoon basins, while Ixtepeque obsidian was taken down the Río Motagua and north up the Caribbean coast and then brought inland, upriver or on overland routes.

These patterns have several interesting features. First, the greater the proportion of the route covered by water, the farther the obsidian is distributed; the route from Cobán to southern Belize is a foot trail all the way, whereas that from Asunción Mita to Chichén Itzá is more than 80 percent by water. This finding suggests that canoe-transport was more economical over long distances because of the larger load that could be carried. Second, the distribution or "market" areas of the two sources are largely complementary, overlapping only at and near Tikal and in southeastern Peten; this finding suggests that the two sources were being exploited contemporaneously during the Classic period and that there was competition between the two sources for the lowland market, a situation that is well-documented in other cultures[5].

Third, the expansion of the Chol-Chorti Maya tribes southward as far as Asunción Mita[2] would have given them control of the Ixtepeque obsidian source, and this may then have been an important factor in the distribution pattern of the material.

These hypotheses can be tested and either amplified or discarded on the basis of further analyses: additional data should, for example, enable us to document changes through time in the relative importance of the sources and the different routes, and to link this variation with the changing demand for obsidian as population and power waxed and waned at different sites across the Mayan lowlands. One test of this model is the accuracy of predictions based on it: if the model is true, then obsidian from an Usumacinta Basin site, for example, Palenque, should come from El Chayal; that from a Motagua Basin site, for example, Quiriguá, should come from Ixtepeque; and

obsidian from sites in southern Belize such as Lubaantún, and in northeastern Peten, such as Yaxha, should come from both. The model presented here is a skeletal one: it will be interesting to see whether the flesh fits the bones.

—1972

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15

The Itza of Tayasal, Peten

by J. Eric S. Thompson

The Itza played a leading and, in many respects, a mysterious part in the pre-Columbian history of Yucatan. It has been claimed that there were descendants of immigrants from the classical cities of the co-called "Old Empire," and it has been argued that they may have been of non-Maya origin or a Maya group, perhaps Chontal, which had been much affected by influences from Tula, direct or indirect. To them has been ascribed the strong Tula-inspired architecture of Chichen Itza. Whatever their origin, it is generally agreed that the Itza, as well as the Xiu and other non-Maya families in the peninsula, were well mayaized in the centuries following their settlement in Yucatan.

In view of the mystery surrounding the origin of this group it seemed worthwhile collecting the scattered references of an ethnographical nature to the Itza after they had established themselves at Tayasal in the Peten. Although this material sheds little light on origins, it has some value as a sketch of the last surviving Maya culture. The chief sources are the writings of Friar Avendaño y Loyola (Means' abstracts omit much ethnographical material), López de Cogolludo (who uses a lost *relación* by Friar Bartolomé de Fuensalida), Friar Agustín Cano, much of whose writings are to be found in Ximénez, and Villagutierre Sotomayor. It is often difficult to decide whether variant versions in Villagutierre are due to his careless use of known sources, such as Avendaño and Cogolludo, or derive from sources now lost. A few references are to be found in Cortes' Fifth Letter and in Bernal Días del Castillo. Elorza y Rada has nothing original. To save space I omit all citations, but all statements are drawn from the above authors. For the same reason there is no discussion of Itza history nor of the final conquest by Martín de Ursúa in 1697.

Situation

The Itza occupied five small islands in Lakes Peten and Ekixil and the swampy parts to the west, of which Noh Peten ("Great Island") or Tayasal, sit of the modern town of Flores, was the most important. On the surrounding mainland their territory extended eastward to that of the Mopan (also called the Aical), westward to the Cehach, and perhaps, with vague control, southward to the Rio de la Pasion. Cano says the Mopan were subject to the Itza and formed a single nation, but that seems doubtful. Noh Peten (the modern Flores) is quite small—500 metres long by 250 metres wide—but its population was estimated by Avendaño as about 2,000, with a total Itza population of about 22,000. Eighty years earlier, Fuensalida had estimated that there were 200 houses on the island. On a peninsula of the mainland opposite Noh Peten lies the archaeological site named Tayasal. This is an early site which is shown by potsherds and hieroglyphic texts to have been occupied during the Formative and Initial Series Periods. Morley believed that to have been the historical Noh Peten, but all authorities agree that it was an island, as, indeed, its name indicates. Moreover, Ursúa had to win command of the lake by building a brigantine before he could attack Noh Peten; had this been on the mainland, there would have been no need for such time-consuming measures. Hieroglyphic monuments at Flores itself show that the island also had been occupied at the close of the Initial Series Period.

Government and Society

The head chief of the Itza was called Ahau Canek, a hereditary title or dynastic name. He shared the rule with the high priest, who at the fall of Tayasal was his first cousin and was called Kin Canek (*Ah Kin* is Yucatec for priest). This dual government is suggestive of Mexican practice. Under them were four chiefs, called by the Yucatec title *Batab*, each of whom ruled a separate area or *barrio*, suggesting some sort of *calpulli* organization. Districts also are mentioned, said to be ten in one source, twenty-two in another. Apparently, these districts were subdivisions of the four *barrios*, each with its own petty chief, and one gets the impression that this term was used loosely by the Spaniards to designate villages and their surrounding milpa lands. The inhabitants of a district had their individual names but were also called by the name of their chief, which is again perhaps suggestive of some clan organization and perhaps even of a totemic clan, such as exist to this day among the Lacandon. Priests were also chiefs of several villages. The military title, *nacon*, was used, as also in Yucatan. The Itza were well aware that their ancestors had come from there. One old man, when submission to the Spaniards was being discussed, said ironically that he would like to go to Yucatan so that he could receive title to lands which his ancestors held. The Itza are described as well-built, tall, and rather fair-skinned. They were monogamous. Avendaño says that homosexuality was believed to be common among them, and in that connection it may be recalled that in Yucatan the Itza were continually accused of sexual vices. The same author remarks that men, except priests, who passed the age of fifty were killed for fear they should become wizards. That is the sort of story that might circulate about a little-known people, and possibly may not be true.

Language and Personal Names

The language was Yucatec, but of a somewhat purer and more archaic form than that spoken in seventeenth century Yucatan. None of the surviving personal names is definitely Mexican. Canek, of course, is pure Yucatec, as are most of the others re-

corded. A Cocom is mentioned, but no Itza. However, I once engaged a laborer from Socotz, British Honduras, whose name was Itza, and the natives of Socotz are descendants of immigrants from the Itza village of San José Peten. Incidentally, this Itza was subsequently hanged in Belize gaol. We are told that a person was known by his mother's name followed by that of his father, but that system does not seem to have been universally followed, for the father of a certain Chan was also called Chan and the mother was Xpuc. Also, the brother of Martin Can was Tziuit Can.

Religion

Itza gods, according to Fuensalida, were almost the same as those worshipped in Yucatan, but the names of only six survive: Itzamna Kauil (written Itzimna Kauil), Ah Cocahmut, Kinchilcoba, Hobo, Pakoc, and Hexchuncham or Hoxchunchan. The first three are known Yucatec gods; the others are Itza gods of battle. In addition, the Izta worshipped a stone column representing Yaxcheelcab, ''the first tree of the world,'' which is prominent in Yucatec mythology.

Idols were extremely numerous, for, in addition to the large numbers in the temples, two or three were set on a small bench in every house, and they were kept in caves. There were four very large ones (talking idols?). The idols were of wood, stucco, alabaster (probably crystaline limestone), of the most precious marbled stone (*jaspe*) in green, red, purple, and other colors, and of an unidentified metal. The idol of the god of battle was of *esmeralda bruta* (jade?) and was about eight inches high. Talking idols clearly were of considerable importance. Pakoc was an idol ''who speaks to them very frequently.'' Martin Can, nephew of Canek, during his cross-examination, said that he supposed that the attack on the Spaniards had been ordered by the demons who were in the idols, and added that they had spoken to him many times. Fuensalida says that the idols used to speak to the people and dance with them in their sacrificial dances. This suggests priests dressed to represent the gods, but it may well be that idols, placed on litters, took part in the dances. The talking idols reminds one of the talking idol of Ixchel on Cozumel Island reported in the Relaciones de Yucatan. An interesting point is that the high priest, Kin Canek, when he was imprisoned by the Spaniards, whistled to summon his gods to his aid. In Yucatan the milperos summon the wind to burn their milpas by whistling.

Nagualism seems to have been present. One Itza woman said her *xagual* (misreading of nagual?) always met her at the edge of the lake in the form of a *leoncillo* or jaguar, and she gave him rabbits, curassow, and other birds and products of the chase.

Human sacrifice, with the removal of the heart, was unpleasantly common. The Dominican friars, Cristobal de Prada and Jacinto de Vargas, who had been beaten to the ground, had their hands and feet tied to posts arranged in the form of a St. Andrew's cross, and thus spread-eagled were raised up, presumably to a vertical position. They remained thus a considerable time, preaching to the Itza and praying until the high priest opened their breasts and removed their hearts. The Franciscan, Friar Juan de San Buenaventura, and a lay brother were sacrificed in the same manner. The tying of these martyrs of the Catholic faith to an X-shaped frame is a form of sacrifice not reported from Yucatan, but is reminiscent of the position of the victim in the arrow sacrifice in Mexico (cf. Codex Zouche, p. 84). The eating of the bodies of those sacrificed was a general practice among the Itza. The bones of the Dominican martyrs were deposited in a cave. If enemies were not available for sacrifice, well-nourished boys were chosen from the community, and in such cases it was customary for parents and relatives to take part in the dance which, to the accompani-

ment of music and singing, was a part of the sacrificial rites (cf. the Bonampak murals).

A custom reminiscent of the tzompantli rite obtained among the Itza, for the heads of the members of a Spanish party massacred by the Itza were placed on a row of stakes on top of a small mound in a prominent position. It will be recalled that there is sculptural evidence for the tzompantli at Chichen Itza and perhaps at Uxmal, although there is no report of the rite in Yucatan in the sixteenth century. Placement of heads on stakes did, however, occur in the Alta Verapaz.

Temples

On the main island there were probably twenty temples. Martin Can, in his deposition, said there were fifteen large ones and four or five smaller ones; Canek told Avendaño there were nineteen; Villagutierre gives the number as twenty one, but Fuensalida gives the number as twelve. Villagutierre leaves this description: "*Todas eran casas grandes de casi dos varas de alto de paredes muy fuertes y gruesas a cuya mediania nacía un pretil por dentro, todo ello de cal y canto, revocado y bruñido; y el pretil servía de asiento a los indios, y estaban cubiertos de guano.*"[1] Presumably the height of two *varas* refers to the walls.

The largest structure, the private temple of Kincanek, is described as a square *cu* (pyramid) with a beautiful retaining wall (*pretil*) and nine steps, all of beautiful stone, and each side about twenty *varas* wide and very high. At the top step, at the entrance, there was an idol in human form, squatting on its heels and with an evil face. Inside the temple, at the front, was the idol of *esmeralda bruta* already mentioned (Ursúa kept this), and above it another, of plaster, the face shaped like a sun, outlined with mother-of-pearl and with rays of the same material. In the mouth had been inserted the teeth of slain Spaniards. In the middle of the temple, which was made like a castle, there was suspended from the roof by three cotton ribbons of different colors, a half-rotted shin-bone. Above this was a crown, and below, a little sack, about two feet long, containing bits of rotted bone. On the ground below were three censers with *estoraque* (liquidambar here?) and more *estoraque* wrapped in maize leaves (in other temples copal only was used). The bone was said to have come from the horse Cortes left.

The words, *a hechura de castillo*, applied to the temple suggest a stone roof, although other accounts speak of thatched temples. Moreover, this building was subsequently converted into a church; the dark, narrow rooms of a vaulted temple were hardly suitable for a Christian church. On the other hand, a description of the island speaks of the "*muchos adoratorios, cuevas y bovedas.*"[2]

The temple of Canek, which was of the same general type, contained a large stone altar or table with seats around. A peculiar feature of Tayasal was the prevalence of private temples. However, the common people worshipped in their *cavernas*, as they called them, in the woods and in caves, seldom or never going to the large temples.

Avendaño leaves his description: "There were nine very large buildings for the worship of the said idols, all new, with traces of others which had been burned, although they build them again, as I saw in the case of two which had been rebuilt. All such buildings have a wall about a *vara* and a half high, and a little over four feet

1. "All were large houses of almost two meters [high] with very strong and thick walls at the middle [height] of which on the interior was a reinforcement [bench], all of this being of lime and stone, plastered and polished; and the bench served as a seat for the Indians, and they were covered with palm." —*Trans. by J.A.G.*

2. "Many shrines, grottoes, and vaults." —*Trans. by J.A.G.*

thick, the bench or seat all around, which projects from the middle inwards is about two feet thick, so that both together form two rows of seats around the said churches, and all repainted and polished.'' I take this to mean that the surrounding wall was stepped so that the step and the flat top formed two benches, and there would be a space between its top and the thatched roof. This seems to be confirmed by a remark by Aveñdano to the effect that when he was in the hall which served as a vestibule to Canek's house the multitude was so great the people crowded around the outside, obstructing the light which entered from all around so that the interior was in darkness. This hall, Avendaño remarks, was of the same workmanship as the temples. The space by which light entered from all around would have been between the top of the wall and the roof, showing the latter was thatched. Avendaño adds that at the entrance stood a sacrificial table, called *mayactun*, more than two *varas* long and proportionately broad. It was supported on stone columns, and there were twelve stone seats around it for the priests. Clearly, this is the building described by Villagutierre as Canek's temple. In this building, but not in the other temples, the floor was of polished stucco.

Díaz del Castillo writes that the houses and temples, brilliant in their whiteness, were visible from more than two leagues away. The private dwellings lined the shore; the temples were in the higher center of the island. Ceremonies, however, were also held in the open, for a dance and ceremonial intoxication was held in Canek's milpa, on the mainland, apparently to obtain a message from the gods as to how to deal with Fathers Fuensalida and Orbita.

Priesthood

As already noted, Kin Canek, the high priest, was a first cousin of Canek and shared power with him, but Canek, too, was a priest. Kin Canek admitted that he himself had sacrificed various Spanish prisoners, a duty seldom undertaken by his Yucatec equivalent, the Ah Kin Mai, who was apparently a relative of the Yucatec chief. Priests never combed their hair, the locks of which were continually smeared with sacrificial blood. The same was true of Yucatecan priests. All priests were called kings, which probably means they had the title Ahau.

Calendar and Codices

The Itza had the Maya katun count, and they had codices, including books of prophecy and of history (probably the same thing). These were kept in Canek's house, and he could read them. Martín Ursúa kept these (someone should inquire of the family of the Conde de Lizárraga Vengoa whether by any chance they have survived).

Houses

Outside the main island towns were quite small, for most of the people lived scattered near their milpas. For example, Nich, chief town of the district of Chakan Itza, contained only ten houses, but the total population of the district, distributed in many settlements, amounted to about 600 souls. The same was true of Yalain. Those living on the islands, which were quite small, had houses on the mainland which they occupied while cultivating their milpas. Houses were occupied by an entire lineage, a Yucatecan custom in the sixteenth century.

Houses had stone walls more than a *vara* high, and above that of wood, or the walls were entirely of wood; roofs were thatched. They were not arranged in streets. Apparently, they contained little furniture; there is no mention of hammocks, but they used frame beds with surfaces of tied rods (*barbacoas*). Canek had a sort of small

throne; men generally carried little stools under their arms to sit on whenever the occasion arose.

Clothing and Ornaments

Men wore cotton mantles like the *ayates* of Yucatan or the garment worn by the *Gabachas* (women of the Pyrenees). They were well woven with stripes of various designs and in different colors from top to bottom. They were very lovely, not unlike damask work, and of a felt-like durability, but the colors were not very fast. They were superior to anything produced in Yucatan at that date. The only other garment was the breech-cloth, about twelve feet long and a foot wide, with designs on it and a fringe of colored feathers at each end. At night they wrapped themselves in sheet-like cloaks woven of various strips and with varicolored designs. Women wore only skirts from the waist down and were not so well-dressed as the men.

Some men wore rose-shaped earplugs of silver or of gold and silver, but many of the women had their ears so badly cut they could not wear earplugs. Transversal nose-rods (*vainillas* which could mean vanilla pods) and beads of crystal and red shell were also used. Men tied their long hair with beautiful cotton ribbons woven with many curious designs in various colors and with cords and tassels at the ends; women's hair was rolled up with less care.

Painting and Tattoo

Most men had faces and bodies painted black, often in combination with tattooing; for war, bodies were painted red, faces black. Frequently they tattooed or painted on their faces the animal which they had as a charm (totemic?). One prisoner had all his chest, stomach and thighs decorated, and his penis a monstrosity. This last may have been due to ceremonial blood-letting. One Itza, covered with stripes, said that the man who "painted" them was paid in mantles. One newly baptized Itza had two crosses tattooed on his arms, a painful process which cost him much blood. A cut on the chin from edge to edge was the mark of those who had distinguished themselves in the massacre of Diego de Velasco and his party.

Weapons

Bows and arrows were used in war and hunting. Some arrows had points resembling crystal (rock crystal or European glass?); quivers were very large. Lances had flint blades, nearly nine inches long, two-edged and with sharp points, and the shafts were decorated at the top with feathers of various colors (*cf.* Maya sculpture). Warriors donned feathers for battle and sounded trumpets when on the war path (*cf.* Bonampak murals).

Music

In addition to the trumpets, there is mention of the use of teponaztlis, turtle carapaces, and flutes in the sacrificial dances, in which special singers also participated.

Food and Crops

In addition to the usual foods, the Itza had bananas and onions. They also grew much cotton, pineapples, indigo, cochineal, and vanilla. Unlike the Chol, they used tortillas. They were acquainted with the *pib* (covered pit oven). Much fish and prawns came from the lake.

Trade

Fine textiles were bartered to the Cehach and to Tipu for machetes and axes. Cortes came across a canoe load of salt and maize, and the former was presumably a trade staple. Red shell beads and rare gold ornaments served as currency, and presumably cacao beans, too, although there is no mention of their use. Tayasal was apparently on the old trade route from Acalan to the Bay of Honduras.

Canoes

The Itza had enormous numbers of dugouts, some of which are said to have held more than forty persons; they did not use the sail. An interesting trick of fighting is described: some Itza paddled close to shore, suddenly seized their bows, and, after shooting arrows at the Spaniards, threw themselves into the water, and swam off pulling their canoe behind them.

Sundries

Canek gave Fuensalida two "crowns" and a fan to take to the Governor of Yucatan as a sign of submission, and Martin Can brought Canek's "crown," which was of feathers, to lay at the Governor's feet to indicate acceptance of Spanish rule. Whether this gesture resulted from Spanish influences it would be hard to say. The fan is certainly an aboriginal symbol of rank, and one is remainded of the slab in House E of the Palace and the new Ruz tablet, both from Palenque and both showing the offering of a headdress.

Several Spanish prisoners were kept for two days in a stoutly built corral of wood before sacrifice; one is reminded of the cages used for the same purpose in Yucatan. The Itza used smoke signals extensively, and they raised the right hand to the shoulder to show peace and friendship.

Mexican Traits

From this very limited ethnography of the Itza of Tayasal it is impossible to decide how Mexicanized they had been. The only features which from our scant knowledge seem to be Mexican rather than Maya are: dual form of the chieftainship; developed ritualistic cannibalism; a tzompantli cult, perhaps killing the aged (if true); spread-eagle position of sacrificial victims; and homosexuality. However, all of these could have been borrowed by a Maya people, and, in fact, may have been present in a developed form in Yucatan, except homosexuality, which was prevalent in southern Vera Cruz, but not in Yucatan. On the other hand, light complexion and particularly "the very perfect stature" of the Itza definitely point to a non-Maya group, for the Maya are quite short and rather dark skinned. In that unsatisfactory state we must leave the problem. We can only hope that some day the missing *relación* of Fuensalida will be found.

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16

Sixteenth and Seventeenth Century Reports on the Chol Mayas

by J. Eric S. Thompson

The Chols, with their cousins the Chortis, who form one of the dozen or so main divisions of the Maya linguistic group, are of very considerable importance because their occupation in colonial times of the very heart of the Maya Old Empire region, the area which produced the finest examples of Maya art, suggests that they may well be the descendants of the builders of cities such as Copan, Quirigua, Pusilha, Palenque, and many others.

Cholti, their language, is transitional in the west between the Yucatec division, including the Lacandon language or dialect, to the north and the Tzeltal-Tzotzil division to the south. On the east side of the Yucatan peninsula there is a similar linguistic transition from Yucatec through the Mopan language or dialect of Yucatec to Chol as one travels from north to south. The Chorti stock, on the extreme east of the Chol belt, with its substitution of *r* for the Cholti *l*, supplies a similar linguistic and geographical transition to the highland Maya divisions. This evidence would indicate that the Chols were not recent arrivals in that area, but continued into colonial times to occupy the home in which their language had diverged from those of their neighbors.[1] Any light that can be thrown on their customs may, therefore, be of great importance in a reconstruction of life in the southern cities of the so-called Old Empire.

Aside from that consideration, the Chols are, perhaps, of greater ethnological importance than any other division of the Maya group because from their position they had been influenced very slightly or not at all by Mexican cultural contacts. Our chief sources of information on Maya ethnology, the Yucatecs and the highland Mayas have, on the other hand, been exposed to a varying degree to the penetration of

Mexican invaders and ideas, with the result that frequently it is extremely difficult to separate truly Maya traits from those of Mexican origin.

Such ethnological information as can be gathered concerning the Chols should, therefore, serve as a standard, against which ethnological data from other Maya divisions may be measured. Unfortunately, our knowledge of Chol ethnology is extremely limited. The present-day Chortis[2] and the few scattered settlements of Chols, mainly in the vicinity of Palenque, Chiapas,[3] and El Chol (Belem), Quiche,[4] are culturally almost more mestizo than Maya. However, a few notes on Chol ethnology are contained in the various accounts of the efforts of lay authorities and Dominican missionaries to reduce them to Christianity and the crown in the sixteenth and seventeenth centuries. These scattered references substantiate the view that Chol culture was purely Maya, for the absence of idols and tortilla making, river and mountain worship, and blood letting are known to have been purely Maya features. Unfortunately the data are tantalizingly scanty. Tozzer has published a manuscript letter of 1595 containing practically all that is known of the Central Chols of the Dolores area.[5] Ethnological information from that letter, together with a few scattered references from the Central Chols, largely contained in Villagutierre, and somewhat fuller information concerning the Northeastern Chols of the Manche region comprise our source material.

Chol Subdivisions

The territory occupied in the sixteenth century by the Chols may be divided into three sub-areas, or four, if the Chontals are included. To the extreme east and southeast lived and still live the Chortis. Although the area now occupied by them is not very large, in the seventheenth century it embraced Chiquimula, Esquipulas, Casaguastlan, Camotan, Jocotan, and Copan.[6] Around Zacapa, the Motagua River, and the Dulce Gulf were more Chols, a small group of whom were known as Toqueguas.[7] Perhaps these Chols were closer linguistically to those of Manche than to the Chortis.

North and east of Cajabon were the Manche Chols, whose territory is discussed in greater detail below. In the sixteenth century the area south of Manche was probably Chol, for according to Rockstroh, Stoll,[8] and Sapper[9] there is reason to believe that Lanquin and three quarters of Cajabon were once Chol speaking, but that language has subsequently given way to the more aggressive Kekchi. In addition to the ethnological and linguistic evidence adduced by those writers, it is worthy of note that the Manche Chols were in the habit of trading with the Cajaboneros and visiting Cajabon for the feasts, while Cajaboneros invariably served as interpreters, guides, or lay teachers to the converts during the various sixteenth and seventeenth century efforts to reduce the Manche Chols.

West of the Manches, but east of the Chixoy River were the Acalas, not to be confused with the people of Acalan, in the vicinity of the Terminos Bay. Of the speech of the Acalas there is no direct information, but from the location of that group it must have been a dialect of Yucatec or Chol. Fathers Domingo Vico and Tomas de la Torre, who made an *entrada* in 1550, were the first Spaniards to penetrate Acala territory, yet Father Vico knew the language of the Acalas before he undertook the trip, and in the course of his short stay preached the gospel to them at great length. It is true that the good father had the perhaps undeserved reputation of being able to learn a language in three days and of speaking no less than seven, yet it is hard to understand how he could have learnt Yucatec. He arrived in Guatemala from Spain in 1545 and spent the following five years in the Vera Paz and in Guatemala City and its

environs. Therefore, unless he studied Yucatec during his short stay in Campeche, en route from Spain to Guatemala, he had no opportunity to learn that language. His movements in the Vera Paz are not certain, but at least we know he was in Chol territory two years after his *entrada* to the Acala, for at that time he was doing missionary work in the Dulce Gulf region. It is not an unfair assumption that the father had spent his years in the Vera Paz before his *entrada* to Acala preaching in Chol. In any case the other main language of the Alta Vera Paz, Kekchi, was at that time confined to the highlands. The conclusion is inescapable that the Acalas were Chol speaking.

West of the Chixoy River were the so-called Lacandons of Dolores, who in actual fact were Chols. This is proved by Chol words in the manuscript letter published by Tozzer and by the evidence of the copy of the Father Moran *Arte y diccionario* of Cholti which was made in Dolores at about the same time as the manuscript letter was written.[10] The presence of this Chol settlement west of Acala, taken in conjunction with the well-attested location of Manche Chol settlements east of Acala, is further confirmation of the assignment of the Acalas to the Chol linguistic division. Furthermore, Acalas and the people of Dolores were allies, as both groups took part in the massacre of Fathers Vico and Lopez and their comrades.

Roughtly west of Dolores and north of the foothills of the Cuchumatan Mountains was Pochutla, the second large settlement attributed to the Lacandons. The evangelization of this town and the final transfer of most of its inhabitants to Ocosingo, Chiapas, was very largely the work of Father Pedro Lorenzo, who was also responsible for the founding and spiritual care of the settlements of Palenque (near the ruins of the same name), Tumbala, and Tila, which were peopled by Chols he had brought from the forests,[11] and whose descendants speak Chol to the present day. Father Lorenzo, who had come to the Bishopric of Chiapas in 1560, soon became very proficient in Tzeltal and Tzotzil, and obviously must have spoken Chol equally well to have founded so many Chol settlements, and to have won deep affection from his flock.[12] It would, therefore, appear most probable that he spoke to the people of Pochutla in Chol, since so far as is known, he had no means of learning Yucatec, the only other language which might conceivably have been spoken by the Pochutlecs. The belief that Pochutla was Chol speaking finds some confirmation in the name of the cacique, Cham Ahhoal, which has a distinctly Chol flavor.

Of the third large settlement attributed to the Lacandon that of the Lake of Topiltepec,[13] there is extremely little information, and none which throws light on its linguistic affiliation. Yet as it lay between Chol speaking Pochutla and the Chol settlements of the Palenque-Tumbala region, it would seem logical to assign it to the Chols. An Indian boy of Coban, taken prisoner during a Lacandon raid but rescued next day, had understood the Lacandon conversations. As he could only have spoken Spanish, Kekchi, and Chol, the Lacandons could not have been Yucatec speaking.

Only the Indians of Tenosique and Nohha in the abortive Prospero province, fifteen leagues (to the east?) certainly spoke Yucatec. In this connection it is significant that for their conversion priests were brought from Yucatan on the specific grounds that the priests of Chiapas were unable to undertake this mission because of their ignorance of the tongue.[14] Tenosique and the Prospero country were on the edge of the Yucatec territory, and it is, therefore, not surprising that they should speak that language.

It would seem, then, that the Indians south and west of the Usumacintla were Chols; those north and east Yucatecs. Yet, despite the fact that Cogolludo, the authority on the Prospero *entrada*, carefully distinguishes the Prospero Indians from

the Lacandons,[15] and despite the evidence pointing to the Lacandons having been a Chol people, we find the term reserved at the present time for a people speaking a dialect or language close to Yucatec, somewhat resembling Mopan, yet definitely not Chol. Some early writers have got round this difficulty by assuming an eastern Yucatec group of Lacandons and a western Chol group.[16] Is it not more logical to suppose that the present so-called Lacandons south and west of the Usumacintla have drifted thither from north and east of the river during the past two or three centuries since that area was depopulated through the transference by the priests of its original population to more accessible settlements? Should that be so, it is clear that the modern inhabitants have no connection, save geographical, with the historical Lacandons, but may well be descendants of the historical Prospero Yucatecs. Sapper, in his paper *Choles und Chorties* made a very similar suggestion, of which the writer was unaware until after the completion of this paper. Except for Dolores, however, Sapper deduces no evidence that the Lacandons were Chol speaking.

An actual example of re-occupation of Chol territory by Mayas of another linguistic division is supplied by the northward movement in recent years of Kekchis into southern British Honduras[17] and to the banks of the Pasion.[18]

Northwest of the Chol towns of Palenque, Hidalgo, Tumbala, etc., the Chontals still occupy the territory between Macuspana and the coast beyond Comalcalco. The differences between Chontal and Chol appear to be sufficiently small to allow of the former being classed as very close to the latter. Should that be the case Chol and its allied languages or dialectic variants, Chorti and Chontal, occupied at the time of the Spanish conquest a belt of territory from Copan to the Gulf of Mexico, passing through the heart of the area where the stela-corbelled vault-classical art complex was most highly developed (Fig. 1).

Habitat of the Northeastern Chols

The Northeastern or Manche Chols lived north and northeast of Cajabon as far as Manche, their northern neighbors being the Mopan Mayas. West of them were the Acalas vaguely located as east of the Chixoy River. The eastern boundary of the Manche Chols was the Caribbean, while according to Father Delgado their scattered settlements flanked the coast as far north as a point close to Bacalar.[19] Should that have been the case, their northern extension was much greater on the coast than inland. This is a region of lowland rain forest, where conditions now are scarcely propitious for cultural development, although prior to the Spanish conquest, when malaria, and hookworm may well have been unknown, a better environment may have obtained.

In the sixteenth century there were no real towns in this region, the Chols living in scattered settlements of a few houses, the *rancherias* of the chroniclers.[20] The Dominican fathers, however, gathered the Indians, following their pacification, into several of the largest of these settlements, so that they would be under closer supervision. As a result several fair-sized towns were founded, of which San Lucas Tzalac and San Miguel Manche were the most important. Neither of these is still in existence, and their exact locations are unknown.

In a recent study of *entradas* San Lucas Tzalac has been placed a little north of Lake Yzabal,[21] but the evidence clearly points to its location elsewhere. Father Cano, who helped to refound the town, states that it was situated on low ground draining into the Zactun River, and that they made two bridges on the river; one immediate to the town, the other four leagues upstream on the trail to Cajabon. This river, called the Zactun at the mouth, he relates, was known farther upstream as the Maytol, and

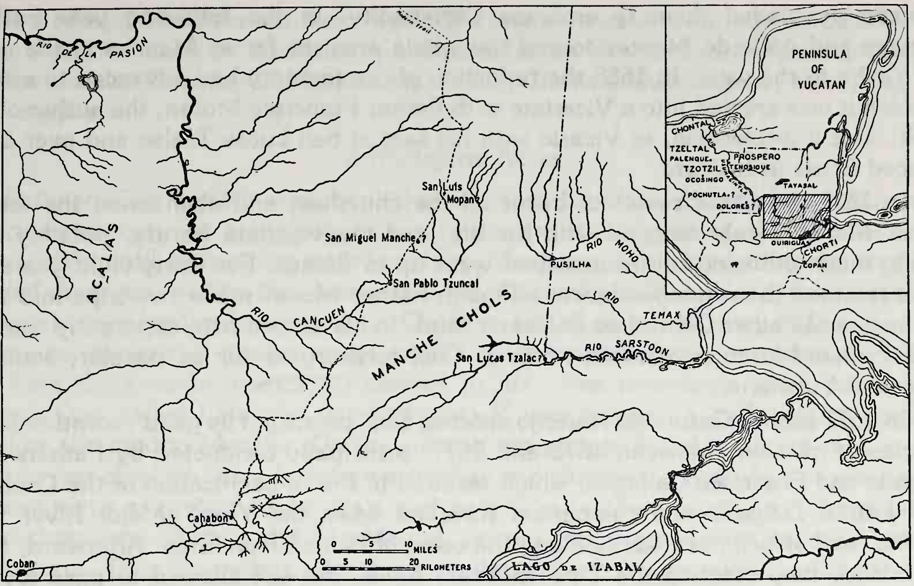

Figure 1. Map of Manche territory and surrounding areas; with insert of Maya area showing Usumacintla drainage and Chorti territory. (Drawn by Edwin M. Shook.)

was formed of the Tiyu River and many other streams, one of the sources of the Tiyu being that stream on which Timuchuch, distant nine leagues from Cajabon, was situated. He also tells us that the Zactun with its tributaries was greater than the Guadalquivir.[22] Father Delgado, on his return from Bacalar followed the coast of British Honduras and then sailed up the Zactun to reach San Lucas Tzalac.[23] There can be no doubt that the Sarstoon and Zactun are the same, for, apart from the close resemblance in names, the Sarstoon is the only river flowing into the Gulf of Honduras at all comparable to the Guadalquivir and the only one with tributaries close to Cajabon. Since Fathers Delgado and Gallegos followed the Maytol in travelling from San Lucas to the Cancuen settlements, one can deduce that that town was situated at or a little below the junction of the Chocon and Sarstoon, and that the Maytol was the Chiruchipec.

San Miguel Manche can be located with fair accuracy. In the account of the *entrada* of Fathers Esguerra and Cipriano in 1603 distances and directions are given.[24] Manche was three leagues east of Chocahan, which in turn was two leagues north of San Pablo Ixil, also called San Pablo Tzuncal, a small town on the banks of the Cancuen River,[25] which still exists. Allowing for the tortuous travel in rain forest, Manche would be approximately as shown on the map. This checks well with the information of Father Cano that there were seventeen and a half leagues from the point where he reached the Cancuen, a short way above its confluence with the Yaxha, to Chocahan, and the estimate of twenty leagues by Fathers Esguerra and Cipriano for the same distance. The Yaxha River has not changed its name. Finally, we are told that Mopan was about six leagues from Chocahan, seemingly in a northeast direction.[26] It is more than probable that San Luis is the same place as the colonial Mopan, in which case Manche must have been very close to where it is located on the map.

History of the Pacification

The pacification of the Manche Chols began in 1603, when Fathers Esguerra and

Cipriano persuaded them to embrace Christianity. In the following year Fathers Cipriano and Alejo de Montes toured the whole area, as far as Manche to the north and Yaxha to the west. In 1628 the reduction of the territory had advanced to a stage at which it was erected into a Vicariate with Father Francisco Moran, the author of the Cholti *Arte y diccionario*, as Vicario with his seat at San Lucas Tzalac and over 6,000 reduced Chols in his care.

In 1633 the Chols revolted, burnt all the churches, and abandoned the towns. Father Moran barely escaped with his life, and the vicariate library, possibly containing much ethnological information, went up in flames. For thirty-eight years the Chols retained their independence, although Father Moran made two trips into their territory, and Father Gabriel de Zalazar a third. In his second trip, apparently made in 1642, Father Moran penetrated north of Chol territory as far as Bacalar, southern outpost of Yucatan.

In 1671 Father Geronimo Naranjo entered Chol country. His good reception led to a series of missions between 1672 and 1677, principally conducted by Fathers Jose Delgado and Francisco Gallegos, which resulted in the re-pacification of the Chols. In 1677 Father Delgado and companion travelled down the Yaxal (Mojo) River from Pusilha, and struck northwards along the coast of British Honduras. Afterward, turning inland, they reached the Tipu (Belize?) River, but not allowed to pass (by the English logwood cutters?), they returned to the Texach (Manatee?) River. Following that river downstream for eight leagues, they were captured at its mouth by English, who took them to the English leader, Barte Charpa (Bertie Sharpe?), on Cocina Cay almost opposite Belize. Subsequently the priest and his companion were released, and reached Bacalar after many sufferings.

In 1678, the Chols, irked by town life and the restrictions of Christianity, once more fled into the forests, and the resident padres, with no flocks to tend, returned to Cajabon. Four years later Father Delgado and two other priests reached San Lucas Tzalac, but found the church burnt and no signs of Indians. In 1685 five Cajabon Indians, sent as messengers to the Chols, were killed, but later in the same year Father Cano and two other priests succeeded once more in pacifying the natives. The pacification lasted four years, at the end of which time the Chols once more revolted. The re-built church of San Lucas Tzalac was burnt, the two resident padres barely escaping with their lives. Later in that same year of 1689, a punitive expedition rounded up such Chols as could be found, and settled them near Rabinal in the Urran Valley, whence a return to the forests was impossible. More Chols were rounded up and despatched to the Urran Valley in 1690 and subsequent years. In 1695 Fathers Cano and Delgado with five other priests accompanied Captain Diaz de Velasco and a small force in an expedition through Manche territory to the Mopan area. Subsequently they penetrated nearly to Tayasal (Ti Ahitza: at the place of the Itzas), but were forced to retire owing to the non-arrival of the main body advancing through Chiapas. However, with the pacification of the Mopans and the conquest of the Itzas two years later, Spanish dominion over the whole area was unchallenged. Practically all the remaining Chols were moved to the Guatemalan highlands, the Manche area becoming what it still is to all intents and purposes, uninhabited forest.

Population and Language

The Dominican fathers claimed that in 1633 there were more than 6,000 souls concentrated in settlements under their care, but these may have included some renegade Indians from Coban, who had fled to the forests. On the other hand, by no means all the Chols had submitted to the fathers. Perhaps a total population for the

Manche area of 10,000 is not over high. One source places it as high as 30,000. Occasional names, such as Alracaham, a Chol chief, or Xcarruchan Mountain, suggest that the division between Cholti and the *r* using Chorti dialect was not so fast as has been supposed.

Ethnological Notes

Religion. The explicit statement that the Manche Chols did not have idols is of particular interest, as according to early sources, the Mayas of Yucatan similarly lacked idols until they were introduced by Mexicans, who, according to tradition invaded Yucatan under the leadership of Quetzalcoatl-Kukulcan, the feathered serpent deity or leader. Instead, these Chols sacrificed to woods, very high and rough mountains, dangerous passes, cross roads, and great whirlpools in rivers, believing that from these came everything needed in life. Two mountains were particularly revered. One, called Vatanchu (straight god),[27] was two and a half leagues north of Cucul on the road to Manche. On the summit the padres found a square rock a yard high, on top of which were burnt pine torches and drops of blood. At this shrine the Indians were accustomed to pray and sacrifice to the mountain. The second, Xcarruchan, was close to the Rio Maytol, on the trail from Tzalac to the Cancuen settlements. This the padres described as the god of the mountains. On top they found a well-swept little plaza with a fire in the center surrounded by a palisade. The Indian porters explained that the fire was kept perpetually alight by travellers, so as to have it at hand for burning their offerings of copal incense.

Remesal states that in the plaza of the settlement of Chocahan stood a crudely made altar of stone and mud, about an arm's breadth in diameter. Here the Indians burnt black wax candles and pine torches, and sometimes sacrificed (turkey) hens and other birds and drew blood from their tongues, ears, temples, the fleshy part of the arms, and other parts. In the course of their travels the padres came upon many crude altars, made of two or three rough stones on the ground with a bower of palm leaves behind, as a sort of *reredos*. At these the Indians burnt copal and made sacrifices similar to those offered at the altar in Chocahan.

Father Delgado describes a penis mutiliation ceremony of the Manche Chols, probably allied to the blood drawing ceremonies of Yucatan. As quoted by Jiminez he says:

> In Vicente Pach's [Pech's] ranch I saw the sacrifices. They took a chisel and wooden mallet, placed the one who had to sacrifice himself on a smooth stone slab, took out his penis, and cut it in three parts two finger breadths [up], the largest in the center, saying at the same time incantations and words I did not understand. The one who was undergoing the operation did not seem to suffer, and did not lose a drop of blood.[28] In fact they seemed very pleased, for many came from various parts [to submit themselves] to the diabolical cutting, and went off [afterwards] very content. I saw this twice to my great astonishment. I took away the cutting instrument from them, I preached against it, and some of them invited me to do the same [whereupon] I hastened to dissuade them from that atrocity and evil.

Some ceremonies, at least, were held in huts used as temples. A brief description of one of these is given by Remesal, who says it was so black and dirty, partly owing to deposition of soot from copal smoke, that it was a disgusting sight. The interior was full of vessels for the (ceremonial) drinking. There were also two stones, on which the sacrifices of incense smoke were made.

Incense burners of pottery were used, and stones, which may have been of jade, were used in religious rites. On the occasion of a chief's sickness an all-night

ceremonial was held, including sacrifices and the burning of incense, apparently to ensure his recovery.

In the Moran dictionary the name of the devil (underworld god) is given as Kisin. The same name was current in Yucatan and among the Dolores Chols. The same source tells us that the underworld was called Xibalba, a name also in use in the highlands of Guatemala, and in Yucatan. The Moran dictionary also gives Mam for idol. This term, meaning maternal grandfather, is used by the present day Mayas of San Antonio in southern British Honduras as a term for the mountains-valley gods of vegetation, and among the Kekchis is applied to certain deified mountains. Were Vatanchu and Xcarrunchan Mams?

Turning now to the information in the Dolores letter published by Tozzer, we find that they had deities of the maize fields, turkeys, cacao groves, and rivers, but the principal ones were Zintun, Ahate, Quizin, Chacmuo, Zainoh, Ahua, Xcacuihalal, Tepecthic, Chua, and Taxanitz. Except Quizin, whose name is merely a variant spelling of Kisin, these names are unknown, but the termination *halal* of Xcacuilhalal means arrow. Some of them may represent local mountains. Particularly important was the lightning, known, according to this letter, as Macon. Judging by the beliefs of the Mayas of other linguistic divisions, the lightning was associated with a group of deities. The padres describe a special lightning ceremony performed by the cacique and four assistants. The people of the settlement leave their houses after placing a pitcher of water beside the burning fire on the hearth. The cacique, ceremonially intoxicated, and his four assistants enter the village like (mimicking?) the lightning. The assistants pass from house to house putting out the fires with the pitchers of water left beside them. Only the fire is kept burning before the idols. At the end of the four days the people return, and every one kills a turkey and sprinkles its blood on pine sticks, which are burnt before the idols. New fire is then carried to the houses, with which the turkeys are cooked for the festival of food and drink, at which as usual they blackened themselves.

In Yucatan the four junior officials who held the arms and legs of sacrificial victims were called Nacons. As Yucatec priests of another order were called Chacs, the name of the thunder and rain deities, one wonders whether the word Nacon can be connected with Macon, the lightning deity of Dolores, particularly as this name may well have been borne by the cacique and his four assistants when they mimicked the lightning. There is often considerable confusion between *n* and *m* in Yucatec vocabularies, indicative of regional differences or a transitional sound.

Sacrifices generally took the form of copal incense and turkey blood sprinkled on pieces of pine. There was a house where the idols were kept, and which also apparently served as a men's house, as we are told that during a wife's pregnancy the husband slept here.

Although shooting with arrows is mentioned as a punishment, there is no account of human sacrifice at Dolores, perhaps because of the presence of the padres. However, human sacrifice was practiced at Pochutla, for during the Spanish advance on that town in 1556 the Indians sacrificed a negro prisoner, removing his heart. Remesal says his heart was offered to the sun, but, according to current Spanish belief, all human sacrifices throughout Middle America were made to the sun. There are various reports of children captured by raiding Lacandons being sacrificed. Villagutierre reports the use of incense burners and many idols at Dolores.

There is no mention of a regular priesthood, either among Manche Chols or Dolores Chols. Indeed, for the latter area we are informed that the caciques performed those functions. On the other hand the Moran dictionary lists two words for

sorcerer. The Dolores caciques celebrated a particular feast, that of the cigarettes. Twenty days were employed making cigarettes in the houses, at the end of which time the people sought deer, fish, honey, etc., which on the appointed day they presented to the caciques in the house of idols. Afterwards the snouts of the idols were rubbed with the fat of the animals, and on the mouths were placed small offerings of ground cacao. Presents of cigarettes were made to the caciques, and the festival was celebrated with eating and drinking, the participants being painted. Divination for lucky days for sowing and harvesting and other work was performed in Dolores with grains of maize and red beans. Divination was also used to decide whether a person would live or die.

Burial Customs. For the Manche region there is no information, but of the practices at Dolores Villagutierre writes:

> These Indians had the custom of burying the dead in open country a short distance from the town and of putting over the graves of men little stools, *puquietas* [?meaning] and other things used by men, and on those of women metates, cooking pots, gourds, bowls, and other utensils of that kind. In their funeral dances they used to go around [the graves?] with their abuses, superstitions and idolatry.

At Lacandon Lake the Indians threw their dead in the water. Remesal, who records this fact, states the custom was due to the lack of land on the rocky island.

Agriculture. According to the Dominican fathers the following plants were cultivated among the Manches: maize, sweet potatoes, cacao, "turkey" beans,[29] chile, tobacco, annatto, plantains, and sugar cane (the last two of European introduction). The Moran dictionary, almost entirely composed in the same area, lists in addition: plums, squashes, avocados, tomatoes, guayabas, mandioc, and anonas. These two sources represent casual references, not attempts to list all cultivated produce. Of very considerable interest is the definite statement of the padres that the Manche Chols did not know how to make tortillas but had to be taught. In this connection it may be significant that Bishop Landa, our best source for Yucatan ethnology, makes no mention of tortillas, although describing at some length other methods of serving maize preparations. Moreover, pottery comal griddles are notably rare in Peten archaeological sites. The padres report the use of tamales, balls of maize, posol, and mixtures of maize with other herbs. The Moran dictionary lists metates, comals, both plain and with holes punched in them. For Dolores Villagutierre mentions maize, beans, chili, plantains, sweet potatoes, jicamas, plums, cultivated zapotes (mameys) and, in addition to others, pineapples, not improbably a post-Spanish introduction.[30] For the same town Villagutierre reports the comal. The presence of the comal does not necessarily imply tortilla making, as this is used among other things for roasting cacao beans.

Industry. The Manche Chols made their own breech clouts, and a few words connected with weaving are given in the Moran dictionary.[31] Copper axes, undoubtedly obtained in trade, were used in clearing milpas. They could not have been very efficient, as we learn that three or four days were required to fell a very large tree. Bows and arrows were used, and the Moran dictionary lists blowguns. Lime was made from certain shells and an obscure passage suggests that cacao beans and annatto were used as currency. To indicate a desire to communicate with outsiders bundles of cacao were left in trees. Hammocks of net technique were used, while the Moran dictinary gives baskets, net bags, and beds. Pottery making is indicated by the pottery incense burners, and confirmed by various types mentioned in the Moran dictionary. The latter source also lists flutes, the cochineal worm, turkeys, merchants,

fish hooks. For Dolores Villagutierre reports blowguns, bows and arrows, stone metates and mullers, pottery, calabashes, suspended cradles of cane, beautifully worked axes of dark green stone used in clearing milpas, dogs, European chickens, turkeys and many tame macaws.

Dress. Father Cano relates a meeting with six completely naked Manche Chols, but Father Remesal says of them that they always wore breech clouts and sometimes cotton mantles as well. Women wore cloths of striped colored cotton as skirts, but important women, in public, covered head and breasts with a white cloth. Men wore their hair short in front, but the long tresses behind were plaited with locally made cotton ribbons and were gathered up in a kind of aspergill in which were stuck flowers and feathers of various kinds. They objected very strongly to having it cut.[32] Women wore their long hair loose. Men, apparently when on the war path, smeared themselves with annatto, while another group of the warriors, seen by the padres, was decked with feathers.

A Manche chief was captured with his body covered with designs made with a branding iron. If the scarification was made with an instrument of that metal, it must, of course, have been a trade piece. On his chest was a wreath pattern like the alternate flints and steels of the *Tosón* order of knighthood, while on his stomach was depicted a most horrible looking devil. Lacandons, perhaps from Dolores, captured a boy near Coban and dressed him in a wide shouldered, full smock of bark cloth with some painting on it. This may have been ceremonial, as the boy seemingly was to have been sacrificed. Undoubtedly it resembled the painted bark cloth of the modern Lacandon, illustrated by Tozzer. For the Dolores settlement we have only the information that the bridegroom gave the bride new skirts, and that red and black paint was used ceremonially on many occasions, but Villagutierre says men and women there went naked except for a cotton waist band, from which a belt hung down in front. The women were clever at weaving their cloths, dyeing them red with brazil wood and black with a certain powder. Both men and women wore wooden sticks in their ears. Women had the cartilage of their noses pierced for the insertion of horizontal canes or for the suspension of circular ornaments, of the size of a silver *real*, made of what was considered to have been amber.

In the Moran dictionary the word *Yaxtun* is given for blue beads. This, meaning green stones,[33] is suggestive of the highly prized jade. For the Dolores settlement beads and copper bells are mentioned, the latter, needless to say, imported.

Houses. In the Moran dictionary beside the usual word for a house, *otot*, which undoubtedly was used for the usual Maya lowland hut of poles and palm thatch, another word is given with the translation "house made with mud," presumably meaning walls of wattle. In each Manche house lived the owner, his sons, daughters-in-law, grandchildren, brothers-in-law, and relations of other categories. According to the Moran dictionary houses seem to have been provided with lofts. Villagutierre says that the houses at Dolores had open fronts, but sides and backs were closed with pole work. Roofs were of straw. In each room was a wooden bed of barbecue type sufficiently large to hold four persons. There were small beds for children. At Lacandon of the lake, according to Remesal, the houses were large and white. This suggests calcimined walls. At Dolores the chief's house had a verandah, suggestive of the type of house used by Yucatec chiefs.

Calendar and astronomy. No Chol calendar is mentioned by writers, except that the new year celebration at Dolores was called *Chuntal Catuz.* The first word means in Chol, "seat," but is also connected, through its original meaning of root or base, with "beginning" in most lowland Maya languages. However, we know from Yucatecan

sources that the Katun (twenty vague year period) had its seat, and the meaning here is probably analogous. The meaning of *Catuz* is uncertain: It may be significant that a great feast and ceremonial intoxication was planned in a Manche Chol settlement for June 27, 1604. According to the correlation of the Maya calendar in Yucatan made by Bishop Landa, and allowing for leap day corrections, and the shift from Julian to Gregorian, which took place in the interval, this day coincided with 8 Cumhu, the mythical start of the Maya calendar, and an extremely important event in the Maya year. A list of Maya months in an almanac from Lanquin, Alta Vera Paz, was published a few years ago.[34] The fact that Lanquin was probably once Chol territory,[35] together with linguistic evidence of the closeness of several month names to those of Yucatan and non-Kekchi features such as the Chol *Yax* in place of the Kekchi *Rax*, supports the writer's original contention that the month names are Chol, although the rest of the almanac is written in Kekchi, the present language of Lanquin. The Moran dictionary gives *Xulab* as a generic name for star. This word is still current among the Mopan Mayas of San Antonio, British Honduras,[36] as a name for the planet Venus. There is a possibility that it is of Kekchi origin, since in that language it means guardian of the animals, according to information of a resident in the Kekchi country. The word *Apizocab* is translated as "Venus star or, rather, star which lasts all night." The name should doubtlessly be written *Ahpizacab* with the meaning measurer of the night. The Yucatec Motul dictionary gives *Ah ppizakab*,[37] "morning star that appears early [in the night] and runs all through it as though it were measuring it." This could not, of course, apply to Venus, but might describe any star or the planets Mars or Jupiter when not far removed from opposition. Elsewhere in the Moran dictionary the morning star is listed as *nohec*, meaning great star.[38] The Pleiades are given as *Uc chahom* (seven together?). The moon is *u*; the sun is *quin*, sunset being *ochquin* (enter sun) and the sun's rays being poetically described as *u halal quan* (the sun's arrows or spears). Directions are: east, *tzatzib quin*; north, *nohek*; west, *u yochib quin* (the sun's entrance); south, *nool*.

Relationship terms. Material in the Moran dictionary is not sufficient to cast much light on the classificatory system used by the Chols, but the few indefinite terms given suggest that it was of the same pattern as that used by the Yucatecs[39] in the use of reciprocal terms of address, although the material is too scant to indicate whether cross-cousin marriage had been practiced.

The following terms are listed: *mam*, grandfather and grandson; *itzin*, younger brother and grandson; *mim*, grandmother and grandson (granddaughter?); *mi*, uncle older than father (with prefix *no*[*h*]) stepfather (with prefix *tzeh*), and presumably father (not listed); *na*, mother, stepmother (with prefix *tzeh*), aunt older than mother (with prefix *no*[*h*]); *mu*, sister-in-law; *han* and *achalcan*, brother-in-law; *nial*, son-in-law (the Starr vocabulary from Tila gives this word as meaning father-in-law); *ichac*, nephew; *ichan*, uncle; *zacun*, elder brother; *itan*, sister; *choc*, son or daughter; *hatzil*, woman's child's mother-in-law.

The term *no*, undoubtedly *noh*, has the meaning of great, the prefix *tzeh* has in Yucatec the meaning little, and is there similarly used as a prefix, but with the sense of younger. These terms are suggestive of cross-cousin marriage when taken in connection with the terms used by the linguistically closely related Yucatec.

The Chol vocabulary in Leon Fernandez also lists *nia*, mother; *tiat*, father; *peenel*, son; *hal*, daughter; *tzuscun* (older?) brother; *chich* (older?) sister. The last is of particular interest since in Yucatec *chich* has, among other meanings, that of wife's brother's wife. Since *ch* in Chol becomes generally *c* in Yucatec, the term *chich* corresponds to the Yucatec *cic*. This relationship term is used for various relations includ-

ing older sister. It is thus clear that originally the term *chich* was used both for elder sister and for wife's brother's wife presumably before Yucatec was differentiated from the other lowland languages or dialects. It is scarcely necessary to point out that with cross-cousin marriage one's sister is also one's wife's brother's wife.

The Manche Chols were polygamous, since many are said to have died of a mixture of anger and melancholy on being restricted to one wife after transportation to the Rabinal area. The Dolores Chols, on the other hand, were monogamous according to the authors of the manuscript letter and Villagutierre.

A fairly detailed account of a Dolores marriage ceremony is given in that letter.

> Marriages are made in this fashion. The young man goes alone to ask for the young woman, and if she is promised to him, he remains at the house of his parents-in-law for a year. He eats and sleeps there with her as though they were married, and if they do not agree well in that year, the young man seeks another woman and she is lost. But if they agree, at the end of the year they bring together many turkeys, etc., and the women guests paint themselves and paint the bride and decorate her hair and neck with as many beads, *tistines*, and copper bells as can be procured. And the men paint the bridegroom like themselves, black like devils. The form of the marriage is: the bride gives the bridegroom a small stool painted in colors, and also gives him five grains of cacao, and says to him "These I give thee as a sign that I accept thee as my husband." And he also gives her some new skirts and another five grains of cacao, saying the same thing. The cacique, who is the priest on all these occasions, joins their hands, places for them a *petate* [mat] in the middle of the house, and there the newly wed couple take their seats. Then the whole house is filled with guests with their small stools, eating and drinking, and now and then the newly married ones dance.[40]

There is no information as to restrictions on choice of a spouse, but Villagutierre says *Calpuls* or *Chirimitals* (clan or sib groups, perhaps geographical) existed at Dolores.

Social customs. At Dolores it was customary for a man to sleep in the house of idols from his wife's fifth month of pregnancy until the birth, not taking up residence in his house until the fifth day after that event. Twenty days after birth, in the presence of all the relatives, an old woman passed a comb under the child's short hair, and singed the ends with six successive lighted sticks of pine wood. Subsequently these six sticks were anointed with turkey blood and, together with much copal, burnt on a large pile of pinewood in the house of the idols. Then the high priest (chief cacique?) came out and gave the child a name, smearing its whole body with black and red, and placed over it a garland of small macaw feathers called *quen*. Thereupon all returned to their houses and a big feast was held.

The people of Dolores were in the habit of confessing to their caciques when sickness afflicted a member of the family, holding the belief that the sickness would end in death unless confession were made by son, father, or husband, etc. Should the whole community be suffering from plague or sickness, the confession of a serious sin would lead to the shooting of the sinner with bows and arrows. Attendants did not eat or drink before a chief. Apparently a chief served as priest for the members of his clan or sib, although among the prisoners taken to Guatemala city from Lacandon of the lake were two individuals said to have been the cacique and high priest.

In the Moran dictionary words for mask and dance are listed. Terms are also given for various tradesmen and professionals, such as carpenter, mason, tailor, trader, doctor, and teacher, suggesting fairly advanced specialization.

Cortés and the Chols. Cortés, both during his march to Nito and during his

subsequent forays in the Lake Yzabal region, was in contact with Chols. However, his account, dealing primarily with the search for food, has little of ethnological importance in it, and, furthermore, his explorations from Lake Yzabal took him also through Pokomchi territory, and it is impossible to attribute his remarks to any particular group. Yet one of his two references to turkeys, pigeons, partridges, and pheasants (curassows) kept in cages probably applied to the Chols.

Summary and Conclusions

From the woefully meager source material one gets an impression of a simple culture of Maya pattern lacking the highly developed religious and secular organization of Yucatan or the Guatemalan highlands. This is particularly noticeable in the absence of a regular whole-time priesthood in both Manche and Dolores, and in the lack of towns in the Manche area and their small size in the Acala-Dolores-Pochutla regions. This feature is emphasized in the Moran dictionary by the absence of a specific word for town, the word *luum*, a generic Maya term for land, serving as a substitute.

Linguistic evidence shows that the people called Lacandons in the sixteenth and seventeenth centuries were actually Chols. The present day Lacandons, speaking a language or dialect very close to Yucatec, probably moved into this region after the Chols had been removed by the padres.

In seeking to place this poorly known Chol culture a few points are worth noting. The Dolores hut set aside as a combined temple and men's hut corresponds to the modern Kekchi *ermita*[41] and the modern Lacandon hut for idols.[42] Men's houses also existed in Yucatan, but these seemingly did not also serve as temples. In the worship of mountain and river deities the Chols, of both Manche and Dolores, are closer to the Kekchis and other highland Mayas as well as to the Mopans, Chontals, and Tzeltals[43] than they are to the Yucatecs and modern Lacandons, among whom this cult is absent or poorly developed.

Lofts in huts are shared by Manche Chols and Kekchis, but are missing among Yucatecs and Tzeltals, and even among the Mopans. In the free use of pine wood for sacrificial purposes the Chols are again closer to highland Mayas than they are to Mopans, Yucatecs of British Honduras or Yucatan, or the modern Lacandons. However, the absence of this feature in Yucatan may be due to the rarity of pine wood there.

It is difficult to say to what extent Kekchi resemblances are due to absorption of Chols by the expanding Kekchis. Sapper has already called attention to Chol words now incorporated into Kekchi.[44] A possible addition to his list of ethnological importance is *icbolai*, the Kekchi name for the rattlesnake, of which the hammock of the Mam is made, but given in the Moran dictionary as a species of snake. *Xulab*, to which reference has been made, may also be a borrowing.

A penis mutilization ceremony, seemingly similar to that of the Chols, can be inferred from a late seventheenth century account of the Mopans,[45] who, judging by their apparent descendants now living in San Antonio, British Honduras, must have been culturally as well as geographically close to the Chols.[46] A somewhat similar ceremony has been reported by Bishop Landa as existing among the Yucatecs.

Our study shows that the Chols were not only geographically and linguistically intermediate between Yucatecs and highland Mayas, but also culturally so. However, such scant information on Chol ethnology can hardly be used to link that people with the ethnologically almost as little known Maya Old Empire. Nor has the time arrived when we can delineate with any assurance the cultural subdivisions which undoubted-

ly existed in that region. Unfortunately Maya archaeological collections consist overwhelmingly of sculpture, ceremonial objects, painted pottery, jades, and other showy pieces. These may be considered to reflect the unifying influences of the hierarchical cult, comparable, perhaps, in its effects to Mohammedanism. On the other hand, features such as metates and mullers, and sherds of unslipped or monochrome slipped pottery which might well be representative of the underlying ethnological and, perhaps, linguistic subdivisions, are almost completely absent from all collections except those most recently made. Whether, therefore, this belt of Chol territory is reflected in the archaeology of the area must remain in doubt until more is known of the humbler arts and crafts.

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References and Notes

1. W. E. Gates, *The Mayance Nations* (Maya Society Quarterly, Vol. 1, pp. 97-106, Baltimore, 1932). This contains an able summary of the linguistic position of the Chols. Sapper and Stoll have published linguistic maps showing the Cholti belt.
2. Charles Wisdom, unpublished report on the present-day Chortis. Mr. Wisdom spent two seasons among the Chortis of the Camotan-Copan region.
3. F. Starr, *Notes on the Ethnography of Southern Mexico* (Proceedings, Davenport Academy of Natural Sciences, Vol. 9, pp. 63-172, Davenport, Iowa, 1901). This contains a short section on the Chols of the Palenque region and an abbreviated Chol vocabulary. A second vocabulary from this region is published in L. Fernandez, *Lenguas indígenas de centro-america en el siglo XVIII, según copia del archivo de Indias . . .* (San Jose de Costa Rica, 1892).
4. F. Ximénez, *Historia de la provincia de San Vincente de Chiapa y Guatemala de la orden de Predicadores* (2nd ed., 3 vols. [Biblioteca Goathemala], Guatemala, 1929-1931), Book 5, Chapter 51.
5. A. M. Tozzer, *A Spanish Manuscript Letter on the Lacandones in the Archives of the Indies at Seville* (Proceedings, 18th International Congress of Americanists, pp. 497-509, London, 1912).
6. Ximénez, *op. cit.*, Book 4, Chapter 3.
7. A. de Remesal, *Historia general de las Indias occidentales y particular de la gobernación de Chiapa y Guatemala* (2nd ed., 2 vols. [Biblioteca Goathemala], Guatemala, 1932), Book 11, Chapter 20.
8. O. Stoll, *Guatemala: Reisen and Schilderungen aus den Jahren 1878-1883* (Leipzig, 1886), pp. 359-60.
9. K. Sapper, *Choles und Chorties* (Proceedings, 15th International Congress of Americanists, Pt. 2, Quebec, 1906, pp. 423-65), pp. 433-35.
10. *Arle y diccionario en lengua cholti* (Publications, Maya Society, No. 9, Baltimore, 1935: in facsimile). A manuscript copied from the *libro grande* of Fray Pedro (*sic*) Moran of about 1625. The name should be Francisco Moran. There is evidence in the arrangement of the words that the dictionary was converted from Chol-Spanish to Spanish-Chol.
11. Ximénez, *op. cit.*, Book 4, Chapter 41.
12. *Ibid*, Book 4, Chapters 47 and 48.
13. There seems little doubt that the Lacandon of the lake is not the same as the Lacandon subsequently named Dolores. Lacandon of the lake was on an island, which the Spaniards in their invasion of 1559 had to approach in boats, whereas Villagutierre tells us that Dolores was situated in open country with some savanna around and implies that water was scarce (J. de Villagutierre Soto-mayor, *Historia de la conquista de la provincia de el Itza*, 2nd ed. [Biblioteca Goathemala], Guatemala, 1933, Book 5, Chapter 6). Furthermore, Dolores could not have been far west of Acala territory, if not actually a part of it, whereas Lacandon of the lake was reached by the army advancing from Chiapas before Pochutla, and must, therefore, have lain roughly west or southwest of the latter town, which we are told was in the foothills of the Cuchumatanes, and therefore well west of Acala territory.
14. Diego Lopez de Cogolludo, *Historia de Yucatan* (3rd ed., Merida, Yucatan, 1867-1868), Book 12, Chapter 3.
15. *Ibid.*, Book 12, Chapter 7.
16. G. H. Berendt, *Report of Explorations in Central America* (Report, Smithsonian Institution for 1867, pp. 420-26, Washington, 1867).
17. J. E. Thompson, *Ethnology of the Mayas of Southern and Central British Honduras* (Anthropological Series, Field Museum of Natural History, Vol. 17, No. 2, Chicago, 1930), p. 36.
18. T. Maler, *Explorations of the Upper Usumatsintla and Adjacent Region* (Memoirs, Peabody Museum of American Archaeology and Ethnology, Vol. 4, No. 1, Cambridge, Mass., 1908). A Kekchi settlement at Cancuen is mentioned on p. 39.
19. Ximénez, *op. cit.*, Book 4, Chapter 31. This coastal area is also assigned to the Mopans.
20. In this connection it is interesting to note that there is no native word for town in several of the Maya languages or dialects. Instead the Aztec word *tinamit* is generally used.
21. D. Zemurray Stone, *Some Spanish Entradas* (Middle American Research Series, Tulane University of Louisiana, No. 4, pp. 213-96, New Orleans, 1932). Mrs. Stone justifies her position for San Lucas Tzalac by Ximénez' statement: "They [the priests] got news that toward the side of the Chol [i.e. El Chol region] bordering on the Gulf Dulce and the castle of Santo Tomas there were many Chol Indians. With this news they returned to the town of San Lucas Zalac, which is *nearer to the gulf*" (italics of Mrs. Stone). However, she has overlooked the preceding statement (F. Ximénez, *op. cit.*, Book 5, Chapter 29) that the news reached the padres when they were in the vicinity of Manche and Chocohan. San Lucas would be nearer the gulf whether located near Lake Yzabal or on the Sarstoon, but actually would have been off their route if located near Lake Yzabal. The fact that the padres, speaking of San

Lucas, say that "here" the river was called Maytol, and that they travelled northeast to reach the Zactun part near the mouth fits in with the location suggested in this paper. Obviously, too, one would not cross the river twice, once very close to the town, in going to Cajabon had San Lucas been situated near Lake Yzabal.

22. Ximénez, *op. cit.*, Book 5, Chapter 45.
23. *Ibid.*, Book 5, Chapter 31.
24. Remesal, *op. cit.*, Book 11, Chapter 19.
25. Mrs. Zemurray Stone places Manche northeast of Tzuncal in contradiction to the sources just given. She relies largely on Gavarrete, whose map, made almost at the close of the nineteenth century, is, so far as deserted sites are concerned, clearly guesswork aided by an incomplete study of source material.
26. Ximénez, *op. cit.*, Book 5, Chapter 58.
27. *Chu* means god. Can there by any connection with Votan, the Tzeltal cave (and mountain?) god? Straight god seems somewhat meaningless.
28. The statement that no blood was lost would appear dubious. Apart from physical difficulties, the similar ceremony in Yucatan was definitely to draw blood.
29. "Turkey" beans are listed by Thomas Gage, *A New Survey of the West Indies or the English American, his Travels by Sea and Land* (3rd ed., London, 1677). Gage accompanied his friend, Father Moran, on one of the *entradas* to the Chol country (Chapter 20).
30. Thompson, *op. cit.*, *p.* 193.
31. Gates, in his introduction to the Moran *Arte y diccionario*, has pointed out the fact that the Kekchi word for huipil, *pot*, is listed here, as well as *lec*, explained as a Chol huipil. From this one infers that Kekchi huipils were traded to the Chols. The writer, however, for various reasons outside the scope of this paper, believes that *po*, the Kekchi name of the moon, from which *pot* is derived, may be a generic Maya root for moon.
32. Cutting the hair was a punishment among the Yucatecs (Cogolludo, *op. cit.*, Book 4, Chapter 4).
33. Most Maya divisions do not verbally distinguish between green and blue.
34. W. E. Gates, *A Lanquin Kekchi Calendar* (Maya Society Quarterly, Vol. 1, pp. 29-32, Baltimore, 1931); J. E. Thompson, *A Maya Calendar from the Alta Vera Paz, Guatemala* (American Anthropologist, Vol. 34, pp. 449-54, 1932).
35. See notes 8 and 9.
36. Thompson, *Ethnology of the Mayas*, p. 63.
37. The Martinez edition gives *Ahppizba hab*, but an examination of a photostat of the original copy in the Carter Brown Library shows the *b* rubbed out, and a light stroke, the presence of which converts Martinez' *h* into *k*.
38. In the Motul dictionary of Yucatec *Noh Ek* is definitely stated to be Venus.
39. F. Eggan, *The Maya Kinship System and Cross Cousin Marriage* (American Anthropologist, Vol. 36, pp. 188-202, 1934).
40. A. M. Tozzer (*op. cit.*) calls attention to resemblances to marriage ceremonial depicted in Mendoza Codex. The above translation is that of Tozzer.
41. K. Sapper. *Das nordliche Mittel-Amerika nebst einem Ausflug nach dem Hochland von Anahuac* (Braunschweig, 1897), p. 275.
42. A. M. Tozzer, *A Comparative Study of the Mayas and Lacandones* (Archaeological Institute of America, New York, 1907), p. 11.
43. F. Blom and O. La Farge, *Tribes and Temples* (Middle American Research Series, Tulane University of Louisiana, No. 1, New Orleans, 1926), pp. 368, 500.
44. Sapper, *Das nordliche Mittel-Amerika*, p. 397.
45. Ximénez, *op. cit.*, Book 5, Chapter 58.
46. Thompson, *Ethnology of the Mayas*.

17

Some Postclassic Questions About The Classic Maya

by Munro S. Edmonson

The Postclassic and Colonial texts of the "Books of Chilam Balam" tell us very little, or so I believe, about the Classic Maya directly. And that little, though very precious, is confined to brief passages in the first three Chronicles, and may have been reshaped to fit the mythological predilections of a later age. The Chronicles being much the best known passages of the *Books* to Mayanists (Barrera 1948; Roys 1935), and the events they chronicle being as much as a millennium removed from the composition of the surviving versions, I shall eschew here any attempt to interpret their direct relevance to Mayan Classic history in detail. While the *Books* do not give us direct answers to our questions about the Classic Maya, they do raise some interesting questions about Classic Maya culture to which archeology, art history and epigraphy may eventually supply answers. It is the object of this paper to isolate some of these questions, primarily social, calendrical and literary.

The basis of these queries is my recent translations of the *Books* of Tizimin (Edmonson n.d. a: completed) and Chumayel (Edmonson n.d. b: in draft). Largely on internal evidence, I conclude that the extant versions of these two *Books* date to the period between 1824 and 1837. Even if, as I believe, they contain passages transcribed from pre-Conquest glyphic texts, they are nonetheless separated from the end of the Classic period by nearly a thousand years. They present corresponding

As originally published, Professor Edmonson's paper included a substantial appendix discussing possible seatings of the *katun* and the *may* and which has particular relevance to his "Questions 14, 15, and 16." Students wishing to pursue these matters in greater detail should refer to the original publication. (Reprinted from *Tercera Mesa Redonda de Palenque*, Vol. IV, pp. 9-18, 1979, edited by M. G. Robertson and D. C. Jeffers.)—*J.A.G.*

problems of interpretation before we use them in the reconstruction of earlier Mayan history.

The historiographic problem may be analogized to the difficulties of using modern ethnography to reconstruct the culture of the pre-Conquest Maya, and the method used here will consciously employ this analogy. Just as we must begin our reach back to the fifteenth century by subtracting Spanish culture from that of the modern Maya, so I consider that the attempt to reach back another five hundred years must start with the subtraction from Postclassic Mayan culture of identifiable Postclassic Mexican influences. Some part of the residue just might tell us something about the Maya tradition before the tenth century. The perils are obvious, but a good question, however arrived at, may sometimes be as valuable as a good answer. My questions concern the kinship system, the calendrical cycles (especially the *may* and the *katun*), and literary form.

Kinship

1. Did the Classic Maya have patrilineal descent groups? Although a number of modern Maya groups including the Lacandon (Rees 1977) clearly do, a number of others, including the Yucatecans (Holmes 1977) do not. In a number of instances the evidence points to a shift among the Maya peoples from patrilineages to the mixed system of bilateral and patrilineal kinship characteristic of the Spanish, or even to straight bilaterality. This cannot be altogether ascribed to Spanish influence, since the Mexica were also bilateral and were an important influence on the Maya during the Postclassic.

I dissent from the view expressed by Haviland (1968) following Murdock (1949) that the evolution of Mayan society proceeded from Hawaiian to Matri-Hawaiian to Patri-Hawaiian to Normal Guinea, as I dissent from Murdock's more general line of argument as being undemonstrated. I do agree with most of Haviland's other points, as will be seen.

The evidence of the *Books* of Chilam Balam points to the inference that the Postclassic Yucatecans, like the modern Lacandon, had a double descent system, at least in the upper classes. But this could have been a consequence of five hundred years or more of bilateral Central Mexican influence interacting with a Mayan patrilineal system. Subtracting this Mexican influence, we would be left with patriliny. An important part of the documentation of such a system relates to the following questions.

2. Did the Classic Maya have preferential cross-cousin marriage? The modern Yucatecans do not, although the Lacandon do. The ethnohistoric evidence suggests that so did the fifteenth century Yucatecans, and there is sporadic occurrence of the custom among other Mayan groups, notably in Chiapas (Guiteras Holmes 1952). The documentation of the marriage system is neither direct nor clear in the Tizimin and Chumayel, but other dimensions of the kinship system (naming, kinship terminology and politics) appear to point to double descent in the upper class (which is at least partly documented) and not necessarily in the lower class (which is not). Such a system is not directly referable to the Mexica but could easily be a consequence of trying to maintain status in both patriline and matriline and hence to justify nobility in terms that met at least in part the requirements of bilateral and patrilineal descent at once. Nobles were descendants of known ancestors in both the maternal and paternal lines (*al mehenob*). The same may have been true of the fifteenth century Quiche (*al q'aholob*). Close in-group marriage for the preservation of status might very well generate such a system within a restricted upper class even apart from foreign influences, and could have done so among the Classic Maya, producing a prescriptive

marriage preference for the nobility and a broader latitude of choice among the more numerous peasantry.

3. Did the Classic Mayan kinship terminology then reflect both patrilineage and double descent? That is what is indicated for the Postclassic, both in the *Books* of Chilam Balam and in the Motul dictionary (Eggan 1938). The question is of course in part linguistic, and will eventually require both reconstruction and a very difficult kind of epigraphic documentation. But despite the contradictions in the ethnohistorical sources (and they are many), it is difficult to avoid the conclusion that more than one terminological system was in use in the Postclassic, and perhaps in the Classic as well.

4. Did the Classic Maya have virilocal residence, and hence patri-compounds? Most modern Mayas are virilocal at least by village, and to a degree by *barrio* or *vecindad*, and the latter is also true of the modern Yucatec. Compounds are furthermore rather characteristic of central Mexico, including Tula (Healan 1977),* though those of the Mexica were not patrilineally defined. House groups analogous to the *vecindades* in modern Yucatan were found at Tikal (Haviland 1970), but have not yet been generally documented for the Classic Maya. Nonetheless the evidence would lead us to expect virilocal residence. The ethnohistoric occurrence of bride price and bride service would lead us to expect uxori-virilocal residence, but that might be very difficult to document archaeologically.

5. Did the Classic Maya have patrilineal primogeniture in succession? Such a tendency is marked among the modern, Colonial and Postclassic Yucatecans as among Colonial Spaniards. It is not a feature of central Mexican society, though it is of most Maya societies. On balance it would be a probable feature of Classic Maya society even if we had no Classic evidence (see Thompson n.d.). Such a rule may not have excluded the succession of women, as in Britain (see Ringle n.d.).

6. Did the Classic Maya have patrilineal primogeniture in inheritance? Land, houses and household furnishings are the principal forms of property in Middle America, but the sense in which they constitute "property" is subject to considerable variation. "Ownership" of land is often a matter of use-right, sometimes under complex community control, while houses, household furnishings and tools are often individually owned. It is my impression that the Mayan groups tend rather generally towards patrilineal primogeniture with respect to land, houses and agricultural tools and matrilineal primogeniture with respect to household furnishings. Ultimogeniture is an important secondary mode and there are many, many exceptions. Central Mexico has tended more towards bilateral equidistribution. In both areas these tendencies have been overlaid by Spanish testamentary distribution of property (well established among the Quiche by the eighteenth century), and by the complexities introduced by modern land reform laws, particularly the Mexican *ejido* (Shuman 1974). The *Books* of Chilam Balam indicate that inheritance was the primary way of acquiring land (an "orphan" is definitionally poor), but say nothing about other forms of property, nor about the inheritance rule. A weak case might be made for expecting patrilineal primogeniture among the Classic Maya.

7. Did the Classic Maya have patronymics? Naming customs may be employed, of course, to signal or emphasize the social groupings implied by the questions already raised, though obviously they do not have to be, and Middle American onomastics is notably complex and variable. The modern Yucatecans have surnames in the Spanish manner. The Postclassic Maya used both in Nahuatl and in Maya a matronym followed by a patronym, and both name groups appear to have implied

*Reprinted in this reader.—*J.A.G.*

exogamy. Given the questions already raised about patrilineage, double descent and cross-cousin marriage, the Classic Mayan naming system might give us a very useful clue to more fundamental features of the kinship system. Admittedly there could have been lineage or dynastic names not carved on monuments, just as Hanover does not normally appear on statues of Queen Victoria.

Calendrics

8. Did the Classic Maya have lords of the *katun*? Postclassic and Colonial Maya clearly did. They received the title Jaguar (*Balam*), or more rarely Lord Serpent (*Ahau Can*), both names referring to their robes of office, and were selected on a rotational basis from among the hereditary governors (*hal ach uinic*) of the thirteen most prominent cities among the 18 provincial capitals. Ostensibly the Classic Maya equivalent could have been lords of cities of the second rank, and their functions would have been different, since by Postclassic times the Jaguar was the supreme ruler of the entire country during his 20 *tun* term of office.

9. Did the Classic Maya have seats of the *katun*? The seat of the *katun* (*hetz' katun*) was the real capital of the region in Postclassic and Colonial times. Though it only served for 20 *tuns* at a time, each city competed vigorously for the honor, since it conferred tribute rights and the right to confirm titles to land and public office throughout the region. While these rights must have belonged to ruling lords of major centers, there may nonetheless have been some ritual rotation of subsidiary responsibilities among the cities of the second rank.

10. Did Classic Mayan lords have Spokesmen (*Chilam*) of the *katun*? Again it is clear that the Postclassic and Colonial Maya did. So too did the Quiche and the Mexica, and the tradition has survived in Quintana Roo into modern times. The Yucatecan Spokesman also acted as the Great Sun Priest (*ah noh kin*) of the *katun* and Sun Priest of the Cycle (*ah kin may*); he was registrar of lands (*ah p'iz te*) and was responsible for the prophecy of the *katun* and the examinations of the officials. Obviously such functions must have been discharged by someone in Classic Mayan times, but not necessarily by a "Spokesman." If such a status existed in relationship to the rulership of major centers it should be iconographically visible; if it related to secondary centers it may be harder to document. I am inclined to guess that Spokesmen may be a Postclassic Mexican addition to Mayan culture.

11. Did the Classic Maya give special status to prophets (*ah bobat*) and hold councils of sages (*ah miatz*)? Councils of sages and prophets were held at Mayapan and Chichen Itza in 13 *Ahau* (1539) and at Merida in 7 *Ahau* (1579). Such councils were apparently called in times of crisis to resolve calendrical and religious issues, and one such may well have been responsible for the founding of the League of Mayapan in 2 *Ahau* (1263). They appear to have resembled the Vatican Councils in function, and they commanded enormous respect, representing in Colonial times the highest moral authority in the country. Such a body might for example have had a role in the investiture of the rulers in Classic times as well as later.

12. Did the Classic Mayan have nicknames for the *katuns*? The Postclassic and Colonial Maya did, and related them closely to prophecy, history and religion. From the ethnohistoric texts, the significance of these names is far from clear, and it seems intrinsically unlikely in any case that they would remain unchanged over a period of several centuries, but the names themselves are strongly graphic, suggesting that some similar pattern might be iconographically or epigraphically indentifiable: flower, wax, tobacco, deer, bird, black, flint, monkey, turtle. The possible significance of this seemingly minor point is related to the following question.

13. Did the Classic Maya have systematic *katun* prophecies? This question is not so simple minded as it sounds. All of nuclear Middle America used the 260 day *tzol kin* for prophecy. Most of it also had prophecies based upon the four yearbearers and the 52 year calendar round (*kin tun y abil*). Only the Yucatecan Maya had *katun* prophecies. In Colonial times these were sometimes (but rarely) confused with calendar round prophecies, and additional cycles were introduced, notably the seven-day week and the 24-year cycle. In the Postclassic there was no such confusion. The suggestion seems strong that the Classic Maya not only had the *katun* itself but also some significant cyclical prophecies relating to it. The ritual importance of the *katuns* is fully attested by *katun* ending monuments. Perhaps some of these contain texts with the curious blend of prophecy and history presented in the *Books* of Chilam Balam.

14. Did the Classic Maya recognize seats of the cycle (*may*)? The *Books* explicitly say they did. In the Postclassic and later the cycle seat (*may cu*) was the primate city of a region. It was not a capital in any normal sense, but rather a holy city, recognized by the title Born of Heaven (*ziyan can, can sih*), and notable for its sacred ceiba tree (*yax che*), its sacred grove (*tzucub te*), its sacred well (*ch'en*), and its plaza, which was the crossroads (*hol can be*) and navel of the world. In the Postclassic the seat of the cycle for the Itza, the "Well of the Cycle" or *Mayapan* from 1243 to 1752, was not even inhabited after 1452, but it continued to serve as a symbol of the religious authority of the *may* for another three hundred years. Perhaps the major centers of the Classic Maya were also seats of the cycle.

Like the *katun*, the *may* is uniquely Yucatecan in the ethnohistorical record, and it is known to be prominent among the Classic Maya, being usually identified as the "count" (*kahlay*) or "fold" (*uutz'*) of the *katuns*. What is at issue here is how the Classic Maya used it. It does not seem to me farfetched to suggest that the apogee of the Classic cities may have corresponded to counts of the *may*, as the following closely related question suggests. It would not be necessary to posit that all Classic cities operated on the same synchronized cycle. The Postclassic Xiu and Itza, for example, disagreed on when to begin and end the *may*.

15. Did the Classic Maya destroy their cities at the end of a cycle? The Postclassic Maya destroyed the primate city and its road at the end of the *may*. There are indications that this "destruction" may have been largely ritual and symbolic, and that the "abandonment" of the city was an evacuation by the ruling dynasty rather than total depopulation. But since the dynasties (*e.g.*, the Xiu and the Itza) did not necessarily agree on the ending date of the cycle, there was room for maneuver in politics, ideology and warfare. The Postclassic theory did not end the legitimacy or existence of a dynasty, but only its right to rule a particular city. A somewhat irregular system of rotation appears to have operated, consonant with the generally cyclic Mayan world view.

Evidence of defacement of monuments is widespread in the Classic Mayan cities, and it seems possible that archeological as well as epigraphic, calendrical or iconographic evidence might be adduced on this question. There is furthermore some evidence that the *may* was not only employed in Classic Tikal and Palenque but that it was defined like the Postclassic Xiu cycle as beginning in 6 *Ahau* and ending in 8 *Ahau*. This appears to be the periodicity of the dynasty that begins with Stormy Sky at Tikal and Lord "X" at Palenque, both initiated at the end of 8 *Ahau* in 9.0.0.0.0 (Thompson n.d.: Ringle n.d.). Thompson (1965:353) notes an abrupt change in the style of Tikal near 8 *Ahau* at 9.13.0.0.0.

16. Does the Classic Mayan cessation of building and erection of monuments

correspond to a revolution in calendrical theory, or to the fulfillment of a cyclical prophecy: Major events of Postclassic and Colonial history can be shown to have a close link to the mystique of the *katun* and the *may*, including the founding and fall of Mayapan, the conversion of the Xiu, the Peten Itza and the northern Itza, and even the Caste War (Bricker 1981: Edmonson 1976: Shuman n.d.). Again, it would not be necessary for the so-called Maya collapse to have occurred simultaneously in different places, for they may have been operating on different cycles even within a common calendar.

There would also appear to be a relationship between the major known changes in the calendar (Edmonson 1976) and important political events. The partial shift from the Tikal to the Campeche calendar in the Usumacinta valley and vicinity may have corresponded to the inauguration of the Postclassic. The shift to the Mayapan calendar in Yucatan in 1539 is startingly congruent with the Spanish Conquest in that area. The shift to the Valladolid calendar in 1752 marks the final separation of the eastern Maya from their more acculturated western neighbors, and sets the stage for the Caste War. It is not necessary to exclude other causes to suppose that the ending of the Maya Classic may have been conditioned by cyclic prophecy: the Maya prophets were often subtle, percipient and realistic. But their prophecies have a way of being self-fulfilling as well, and the last known long-count date, from San Lorenzo, falls in 8 *Ahau* at 10.6.0.0.0, as does the earliest long-count date generally accepted as Mayan, that of the Tuxtla Satuette, in 8 *Ahau* at 8.7.0.0.0. Indeed, the pattern of Mayan history is strongly suggestive of a continuous tradition of major cultural and political changes at the recurrences of the folding of the *may* every time 8 *Ahau* comes around. (See Table I).

Literature

17. Did the Classic Maya use parallelistic couplets? It now seems well established that they did. In a previous paper (Edmonson 1965) I suggested that the form might be related to the common occurrence of paired glyph blocks, but this no longer looks likely as a rule, even though it does occur. Despite criticisms and refinements of my argument (Edmonson 1971) that all formal Maya discourse is in parallelistic couplets, I remain persuaded that the exceptions to this rule are rare enough that it has positive utility in working out the syntactic and orthographic problems of Colonial texts, and I suspect that the same may ultimately prove true of the Classic inscriptions as well. The form is almost the definition of native ''poetry'' from the Rio Grande to Tierra del Fuego.

18. Did the Classic Maya use couplet kennings? Couplet kennings or *disfrazismos* are ubiquitous in Nahuatl poetry and in the supposedly prose texts of the Yucatecan *Books* as well. They are markedly rarer in the *Popol Vuh*, though they do occur. The device depends on the dialectic process of combining the elements of a dichotomy or other dyad to produce a third and esoteric meaning (*e.g.*, rope and cord means war). I am inclined to think this particular form may have been introduced into Yucatan from central Mexico and hence may not occur among the Classic Maya, but the evidence is insufficient for a strong supposition. The presence of such a device in Classic period inscriptions could obviously materially affect their intelligibility, and particularly so in the context of the following question.

19. Did the Classic Maya share esoteric metaphors with their cultural descendants in Postclassic Yucatan? This is a complex problem, and particularly so in view of the historic time and linguistic distance between them. The most explicit data on Colonial metaphors of this type, which differ from the kennings in that they are not

Table 1. The Recurrences of 8 Ahau

B.C.		
846	5.15.0.0.0	?Olmec Period, Early Formative
590	6.8.0.0.0	?Middle Formative
334	7.1.0.0.0	?Late Formative
77	7.14.0.0.0	?Tres Zapotes seats the cycle
A.D.		
179	8.7.0.0.0	?Tuxtla and Tikal seat the cycle
435	9.0.0.0.0	Tikal and Palenque seat the cycle
692	9.13.0.0.0	Tikal, Palenque, Chichen Itza and Bacalar seat the cycle
948	10.6.0.0.0	Champoton and Chichen Itza seat the cycle; end of long-count monuments
1204	10.19.0.0.0	?Mayapan seats the cycle
1461	11.12.0.0.0	Fall of Mayapan; ?Tayasal seats the cycle
1697	12.5.0.0.0	Conquest of the Peten Itza; ? Valladolid seats the cycle

necessarily paired, are contained in the ritual riddles of the lords. Some of these riddles involve obvious Christian elements. They are also explicitly identified with Tula, being designated as "The Language of Zuyua." Nonetheless, the metaphoric usages of the Yucatecan *Books* generally attain the opacity of intentional obscurantism, and some of these might very well be present in Classic inscriptions.

The Colonial texts produce the impression that their obscurity may have been partially designed to keep Maya traditions from the Spanish. They were not at all intended to be secret from the Maya peasantry, who are frequently apostrophized directly. And there are even now Quintana Roo Mayas who can read and understand them. It seems to me quite possible therefore that the glyphic texts of the Classic period could have contained a substantial esoteric and metaphoric element without necessarily impeding their intelligibility for the commoners and laymen to whom they must have been in part addressed. A certain deviousness and indirection may well be part of Mayan tradition. Flies are ancestors; the moon is the end; the sun is the beginning; stalks are lineages; monkeys are peasants.

20. Finally, did the Classic Maya conceive of and use writing itself the way the Postclassic Maya did? Did they write in steps (*tz'acab*) of glyphs? Did they write letters? Did they write their *katun* prophecies? Did they have public readings? Did they write prophecy (*bobatil*) in books (*huunob*) and memorials (*natabal*) on stone (*tun*)? Were the prophetic books kept locally? And on the other hand, were ritual, drama, prayer and song entirely confined to oral tradition? For the Postclassic Maya, the answers to all of these questions is "yes."

The Postclassic codices certainly suggest that the Classic Maya had books of divination and astronomy, and it would be surprising if they had not had books of historical prophecy comparable to the *Books* of Chilam Balam as well. But the content of such works need not have been carved in stone, and perhaps it was not. It may well be that most of the genres of Classic Mayan literature are forever lost to us.

Conclusion

It is hard to imagine attempting to reconstruct the England of *Beowulf* from a collection of brief and esoteric prophecies composed by various hands from Chaucer's to Coleridge's and preserved only in a nineteenth century copy. Would we be trying to project backwards the later character of the English monarchy? The ideology of Christianity? The style of Medieval and Renaissance liteature? Perhaps not. But if we concentrated on kinship, the calendar and really ubiquitous features of English poetry and writing we might not be too wide of the mark. Even so, we should be left feeling more than a little tentative about the attempt.

Only a sense of real pressure on the part of my Classicist colleagues induces me

to speculate on possible points of similarity between the eighth century Mayas and their descendants of five hundred to a thousand years later. I can think of some questions of possile utility, but the answers will clearly have to come from the evidence of the Maya Classic itself. Once I saw that I could not stop at thirteen such questions, I have aimed at twenty, in the belief that the Classic Maya would have approved.

—1978

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18

The Lords of the Maya Realm

by Tatiana Proskouriakoff

We Mayanists spend an inordinate amount of time deciphering half obliterated hieroglyphic texts. Often it seems that our results are not worth all that effort; but now and again some minor fact that hardly seems worth mentioning at the time can be used to pry open a chink in the wall of obscurity that surrounds the past, and suddenly we get a new and exciting glimpse of events that have left their traces on the old stones of Maya sites. When, in 1943, J. E. S. Thompson changed the date of Stela 14 of Piedras Negras, Guatemala, from A.D. 800, given it by Morley, to A.D. 761, the correction seemed of purely academic interest. The stela was on loan at the University Museum since 1933, and Satterthwaite, by the use of studio-quality photographs, was able to substantiate the new readings. Epigraphers made a note of them in their notebooks for future reference, and there the matter rested.

Thompson had described the stela and others like it as showing "gods seated in niches formed by the bodies of celestial dragons" (Fig. 1), and remarked in passing, without ascribing any special importance to the fact, that the correction of the date made Stela 14 the first monument to be erected in front of Temple O-13. One day, several years later, while wondering what the niche and celestial dragon motif might mean, I noticed that Stela 33, though it has no niche, presents a similar scene, and realized for the first time that the new reading of Stela 14 made all monuments of this type the first to be erected in a given location. Monuments with other motifs were then set up every five years in the same place until another similar group was started near another temple. Thus there were distinct sets of monuments, each beginning with a "niche" stela. My first thought was that the "niche" motif represented the

Figure 1. Stela 14 at Piedras Negras. The young lord sits in an elevated doorway or "niche" ascended by a ladder draped with a cloth or carpet with footprints that symbolize his ascent. Above the curtained doorway is a band of astronomical symbols, and at the very top, a bird with serpent-heads on its wings, wearing a grotesque mask and holding a serpent in its mouth. On the jambs are masks of the sun god, and just below, the two heads of the double-headed celestial dragon. In front stands a woman wearing a jaguar headdress and holding a feathered object of unknown significance. At the lower right is a somewhat eroded representation of human sacrifice.

This lord acceded in A.D. 761, just after the Bat-Jaguar of Lintel 3, and ruled less than five years. It may be that Lintel 3 commemorates the restoration of his dynasty after the untimely overthrow of his reign. The correction of the date on this monument led to the discovery of the significance of its motif and to the formulation of the "dynastic hypothesis," which sees the figures of Maya stelae as portraits of reigning lords.

dedication of a new temple, and that the ladder marked with footsteps ascending to the niche symbolized the rise to the sky of the victim of sacrifice, whose body was sometimes shown at the foot of the ladder. It occurred to me that if I searched the inscriptions for a hieroglyph peculiar to these stelae, I might find the glyphic expression for human sacrifice. What I found instead started an entirely new train of thought and led to surprising conclusions.

True enough, there was a record of a date just prior to the erection-date on each "niche" stela, and this date of some immediately preceding event was always followed by a hieroglyph that Thompson, with one of his delightful flashes of humor, has dubbed "the toothache glyph" (Fig. 2). Anniversaries of the event were often subsequently recorded, but only on monuments of the same group. What I had not expected to find was that the only dates that any two groups of stelae had in common were some that marked the ends of conventional time periods, and even this happened rarely, though the recorded dates of two contiguous groups invariably overlapped in time. Evidently each group of monuments presents an independent set of records. Moreover, it is not the "toothache glyph" date that is the earliest in each set, but another that is anywhere from twelve to thirty-one years earlier and is always accompanied by the so-called "upended frog glyph" (Fig. 3). This earlier event could not have had much public importance when it happened since no notation was made of it at the time. It was first recorded after the "toothache glyph" event occurred, and only then began to be celebrated by anniversaries.

Doubtless there are various events in history that are paired in this way, but surely the most common is the birth of some person who in his mature years acquires great prestige or political power. But if the "upended frog" date is a birth date, the fact that it was celebrated for only a limited period suggests that that period was the person's lifetime, and effectively refutes my original notion that the "toothache glyph" expresses the human sacrifice shown on "niche" stelae. More likely, these stelae portray the accession of a new ruler, the "seating on high of the Lord," as the Maya books put it. Subsequent stelae, too, are probably portraits of the lord.

To test this new idea, I calculated the length of time covered by each set of records. There were only three sets whose full span was known, and the figures were 60, 64, and 56 years. These are reasonable lifetimes for rulers who lived at a time when the ordered setting up of monuments suggests tranquil conditions. I was greatly encouraged, feeling that at last I might be on the right track.

The next step, of course, was to identify the names of the lords, or at least to make sure that the birth and accession date referred to the same individual. If so, the "upended frog glyph" (birth date), and the "toothache glyph" (accession) of each set of records would be followed by the same glyph, which would differ for every set. This actually proved to be the case, though the name was expressed by three or four glyphs, and sometimes a glyph was omitted or substituted by another. After all, an important lord is bound to have vari-

ous honorifics and titles. The first glyph was always the same after both dates, and I felt confident that my identification of the name phrases was correct. But did these "names" refer to the sculptured figures?

I was convinced that they did when I examined the texts on Stelae 1 and 2. These stelae are eroded on the front, where the portrait of the lord appears, and on the sides, but on the back each has a complete text and a sculptured figure dressed in a long robe. Many Mayanists had believed that the robe was a priestly garment worn by men, but here both texts record the same birth date followed by the same two name glyphs with a prefix which is clearly a face of a woman, identified by a black (cross-hatched) spot or a lock of hair on the forehead (Fig. 4a). What is more, on Stela 3, which shows a small figure seated beside the one in the robe, the text contains a second birth date, thirty-three years earlier than the final date on the stela. This later birth date is followed by a different set of name glyphs (Fig. 4b), though they, too, are prefixed by female faces. How can one reasonably doubt that both robed figures are portraits of the same person, that the person is a woman, and that her little daughter, not yet born when Stela 1 was erect, is shown on Stela 3 (Fig. 5)? The theme of family suggested by this woman and child is quite consistent with the theme of dynasty in which questions of marriage and descent are always involved, but it would be difficult to reconcile it with a theme of Maya religion.

In retrospect, the idea that Maya texts record history, naming the rulers or lords of the towns, seems so natural that it is strange it has not been thoroughly explored before. The reason is that the only substantial progress made in the decipherment of texts dealt with astronomical and calendrical notations, and these form such a large part of the inscriptions that there appeared to be no room left for historical narrative. The Maya, however, had a conception of history different from ours. Even in colonial times their historical statements were very cryptic and were often mixed with prophesy, for they believed that every event casts its shadow on the future. Thus, if we accept the "dynastic hypothesis," as it is currently called, we may yet find that the birth date of the lord and his accession date were not inscribed for historical purposes alone, but mainly to provide a base for the prognosis of the fortunes of a given reign. This may explain the emphasis on astronomical data given with the dates. In any case, it is well to remember that the hypothesis is still far from being established to everyone's satisfaction. A great deal remains to be done before a crucial test of it can be made. One of the first tasks will be to study the structure of all the purported "name phrases," so that we can separate proper names from titles, lineage designations, and other epithets applied to the lords and their dependents. The identity of some of the persons or entities mentioned in the texts is still clouded with complications and contradictions, and doubtless will continue to trouble us for some time.

There is one group of hieroglyphs in particular for which I have not found a satisfactory explanation. This group comprises jaguar-glyphs with varying prefixes and super-fixes (Fig. 6). Two of the combinations appear to be names of lords who ruled Yaxchilan, a city up-river from Piedras Negras and on the opposite bank. Here, on Lintels 29 and 30, are clearly recorded the birth and accession dates of a certain Bird-Jaguar (Fig. 6b), who also has additional designations. His accession in A.D. 752 is recorded again on Stela 11, where he is shown wearing a sun-mask before three prisoners (Fig. 7). Above him (in the sky?) are two seated figures, a man and a woman, with their names inscribed at the sides. The man's name includes a Shield-Jaguar glyph (Fig. 6a), and elsewhere appears on earlier Yaxchilan lintels, so that even without having the accession date we may suppose that the Shield-Jaguar is the

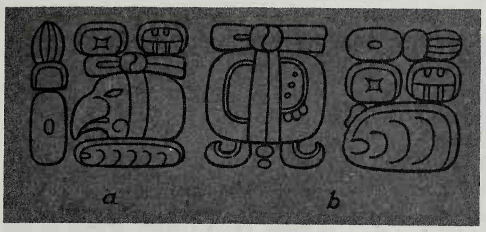


Figure 2. Two forms of the "toothache" or "accession" glyph. This glyph indicates the accession to power of the lord named in the glyphs that follow it. The date of this accession and the birthday of the lord are often repeated on subsequent stelae and celebrated by anniversaries.

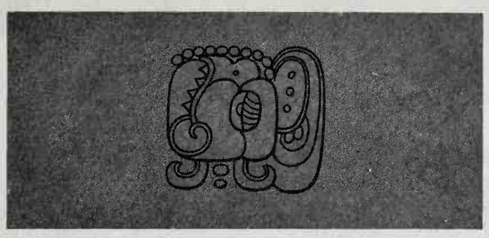


Figure 3. The "upended frog" or "birth date" glyph. This glyph follows the earliest date associated with the group of name glyphs immediately after it. If the name is that of a lord, this birth date may be repeated on later monuments.

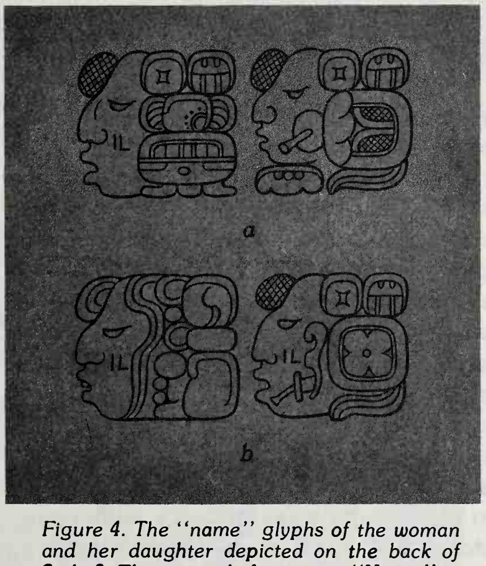
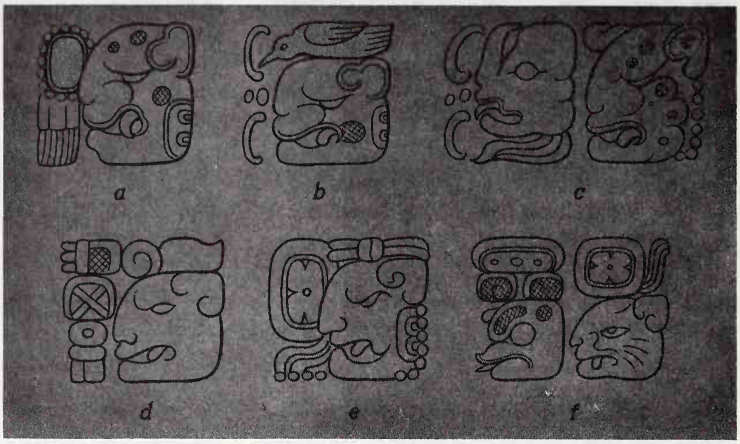


Figure 4. The "name" glyphs of the woman and her daughter depicted on the back of Stela 3. The woman's first name "Katun" is the designation for a twenty-year period, but is known also as a part of a feminine name or title in Yucatan. Women's names are always prefixed by a profile face, identified as that of a woman by the cross-hatched oval or lock of hair on the forehead.

Figure 5. The back of Stela 3, Piedras Negras. The woman sitting on the throne is named in the inscription above, as is the child beside her. Their birth dates are 33 years apart. The front of this monument, portraying the ruling lord, is badly eroded. His name probably appears on the sides, together with the date of the erection of the stela, A.D. 711.

Figure 6. Various combinations of the jaguar glyph.
a: The Shield-Jaguar, one of the "names" of a lord who ruled at Yaxchilan early in the eighth century.
b: The Bird-Jaguar, who succeeded him in A.D. 752.
c: The Bat-Jaguar, whose accession is recorded at Piedras Negras.
d: The jaguar glyph from the "jaguar-protector" lintel of Temple I at Tikal.
e: The corresponding glyph, Kin-Jaguar, from a similar lintel in Temple IV.
f: The "relative?" of the Kin-Jaguar, named on Stela I, Aguateca. (After a drawing by Ian Graham.)



predecessor and perhaps the progenitor of the Bird-Jaguar lord. So far everything is clear and consistent with our hypothesis.

But on Stela 12, which was apparently erected at the same time as Stela 11, the accession date of the Bird-Jaguar is followed not by its usual expression, but by a variant form and then by an unusually complicated name phrase including a Jaguar glyph preceded by a Bat (Fig. 4c). There is some possibility that the Bat-Jaguar is named here as the heir-apparent to the Bird-Jaguar lord, or as a co-ruler or high official. What is curious is that his accession date does not appear at Yaxchilan, but at Piedras Negras, where it is incised on the background of Lintel 3, next to a throne on which a chief holds audience before a group of people (Fig. 9). The precise date of this accession is uncertain (probably A.D. 757, five years after the accession of the Bird-Jaguar, and seemingly during his reign), and it is not recorded on any of the surviving stelae. The lintel itself was carved after A.D. 782, but the dates recorded on it cover more than thirty years, and it is impossible to say which of the recorded events is shown in the sculpture. The first date recorded falls in A.D. 749, and is stated to be the twenty-year anniversary of the accession of a ruler portrayed on Stela 11 of Piedras Negras, in front of Temple J-3. About twelve years after this accession, a very unusual and striking motif was carved on Stela 10, which stands in the same group. Here the lord is shown seated on a cushion, and behind him is a huge jaguar, reared on hind legs and with one forepaw extended forward over the head of the seated figure. There are no hieroglyphs surviving except those of the currently completed period. What can be the meaning of this obviously symbolic scene? Is the jaguar a god-protector of the lord? Is he a foreign overlord to whom the ruler of the town is subject? Or does he represent a lineage, symbolized by the most powerful animal known to the Maya? Above all, is there any significance in the fact that the accession date of the current ruler is linked with the Bat-Jaguar from Yaxchilan on Lintel 3?

According to Satterthwaite's calculations based on radiocarbon dates, near the beginning of the eighth century, probably even prior to the reign of the Shield-Jaguar at Yaxchilan, the motif of the jaguar-protector was carved on a wooden lintel in Temple I at Tikal (Fig. 8). Roughly forty or fifty years later, it was repeated on a lintel of Temple IV, this time with the "protector" in the form of a man, still bearing, however, certain jaguar and sun symbols. The texts of both lintels contain jaguar glyphs (Fig. 6d, e), but not as names of the ruling lords. The rulers' names are known from contemporary stelae, and appear on the lintels with the jaguar-glyphs in clauses. On

Figure 7. Stela 11, Yaxchilan, which records the accession of the Bird-Jaguar, shown wearing a sun-mask, in front of three prisoners. Above are the Shield-Jaguar and a woman, probably his wife.

Figure 8. The "jaguar-protector" motif on a lintel of Temple I, Tikal. The name of the ruling lord is the same that appears on Stela 16, erected in A.D. 711. The lord is seated, and above him can be seen the head of the Jaguar and one extended paw. This motif is associated with another lord in Temple IV, where the jaguar-figure appears as a man.

the later lintel, the jaguar glyph is prefixed by the sign *Kin* (day or sun), and this same Kin-Jaguar is mentioned also on Stelae 1 and 2 at the newly-discovered site of Aguateca, many kilometers south of Tikal. On these stelae, the Kin-Jaguar glyph is part of a name-phrase, but again is apparently not the proper name of the ruler, for it is preceded by another glyph that seems to indicate some sort of relationship between the lord named and the jaguar (Fig. 6f). On accession of the next lord of Aguateca, in A.D. 741, the Kin-Jaguar is replaced by a turtle-glyph, which is one of the designations of the lords of Piedras Negras. One may note that this is the very year when the jaguar-protector motif was carved at Piedras Negras, but whether this fact has any relevance is not at all clear to me.

So far, I have been unable to untangle the obscure connections between the jaguar glyphs and the "protector" motif. What may be significant about them is that all the associated dates seem to belong to that period known as "The Period of Uniformity," when many elements of costume and artistic style, formerly local, became widely dispersed through the Maya area, and when all large cities adopted a uniform

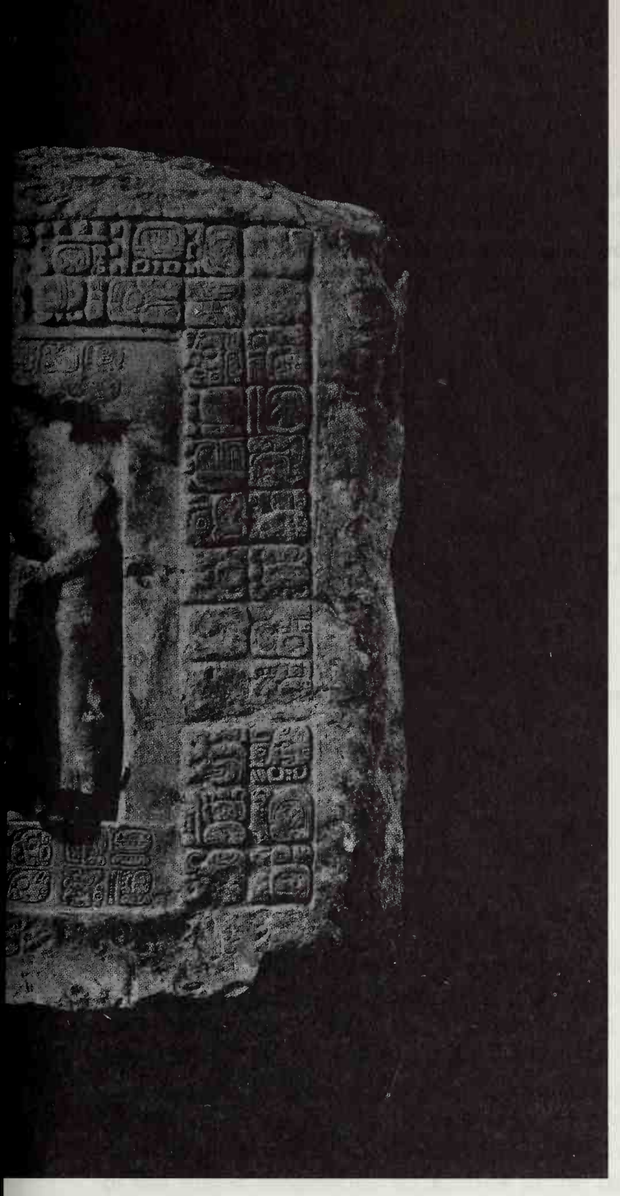


Figure 9. Lintel 3, Piedras Negras. The scene shows a lord, probably the Bat-Jaguar, seated upon a throne before a council of elders. At his right is a small group of men; at his left, three children presided over by a woman servant. This scene may present deliberations which placed the young lord shown on Stela 14 on the throne of Piedras Negras. The lintel, carved after 782, may justify the right of succession of the lord who began his rule in 785.

lunar count. A. V. Kidder once remarked that only under the pressure of political unification is such agreement among a group of clerics conceivable. Perhaps the ubiquitous jaguars of this period hold some clue to the nature of this unification. Is it possible that the lords of Yaxchilan, a city whose militant battle scenes are unique in Maya sculpture, succeeded in subjecting to their will such great and ancient cities of the Peten as Tikal and Piedras Negras, or is it merely that they incorporated in their proper names the designation of a widespread lineage? Was there some political or military alliance that took the name of the jaguar, with member states denoted by varying prefixes?

Such speculation, unfortunately, is just as likely as not to lead us astray. What is needed now is some new fact: perhaps no more than one clarified date, perhaps an observation of some small detail on the sculptures, or some relation between them that has escaped notice. Sooner or later, someone is bound to come upon this crucial little fact that will solve the enigma of the jaguars, and we can take another step forward in the interpretation of Maya texts.

In the meantime, some scholars hold that it won't be long before the electronic computer will solve all the major problems of glyphic decipherment and put our present efforts to shame. One experiment has already been made in Russia, but its results are not published, and its success is therefore still unknown. Much will depend on the validity of the assumptions concerning the nature of Maya writing on which the programming was based. It is not at all certain that a completely linguistic rendering of hieroglyphic passages is possible, but even if it is, we may still be far from understanding their meaning, for known Maya texts of Colonial date, written in Roman characters, are replete with metaphors and allusions completely incomprehensible to us. I hope that no one, relying on the marvels of modern invention, will be deterred from pursuing the more laborious method of minute simultaneous scrutiny of texts and sculptures, which is the only way we can make sure that any reading proposed in the future does in fact express the intention of the text. Even if our most optimistic

hopes are fulfilled, the full understanding of Maya hieroglyphic inscriptions will require many years of effort. However, if it is true that they contain history and narrative, we may expect ultimately to gain a far more intimate knowledge of the social and political aspects of Maya life than, until now, we have dared to anticipate, and it will be exciting to explore various paths by which we might approach this goal.

—1961

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The Altun Ha Jade Plaque: Deciphering the Inscription

by Peter Mathews and David M. Pendergast

Nine years ago, the junior author of this paper published a description of an inscribed jade plaque from the ancient Maya site of Altun Ha in Belize, then British Honduras (Pendergast 1969). The plaque, which measures 20.2 x 6.7 x 1.9 cm and weighs 583.5 grams, was recovered from the tomb of a ruler of the small city-state, and was part of a rich assemblage of burial accompaniments very briefly described in the 1969 article. The crypt (Tomb B-4/6) lay in the core of the level of modification designated B-4, 2nd D in the Temple of the Masonry Altars (Fig. 1), one of the major ceremonial structures in the central precinct of the site. The position of the tomb relative to earlier and later construction in the temple suggested a date for the interment of ca. A.D. 650, and vessels from the tomb, now reconstructed, support that suggestion. A full description of the tomb will appear in Volume 2 of the final report on Altun Ha excavations, scheduled to be published in 1979.

The beautifully executed carving on the obverse surface of the plaque, depicting a figure in right profile seated above two full-front faces (Fig. 2), was described in Pendergast's 1969 article. While the aesthetic and iconographic qualities of the front of the artifact lend it great importance, the feature of greatest significance consists of the 20 glyphs which adorn the reverse surface (Figs. 2, 3). The 1969 article contained an attempt at analysis of the hieroglyphic text which was, to put it kindly, not blessed with great success. Pendergast was not then, nor is he now, an epigrapher; this fact was surely apparent to readers of the article, even though the writing was done at a time when knowledge of the workings of the Maya hieroglyphic system was still in relatively short supply.

The 1969 list of glyphs was followed by a paragraph which seems, in retrospect, a bit too pessimistic even for that time. Pendergast wrote:

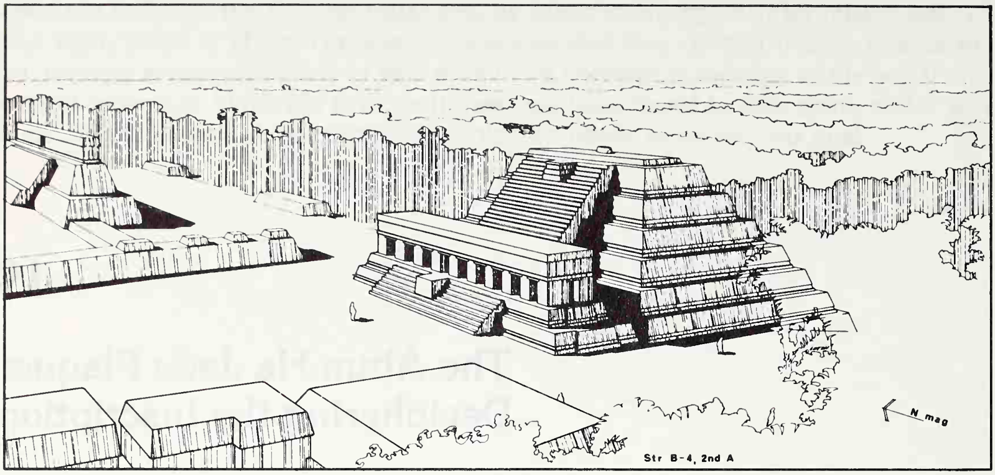

Figure 1a. Structure B-4 as it was before the construction which housed Tomb B-4/6. A slight modification of this stage is shown in the 1969 article.

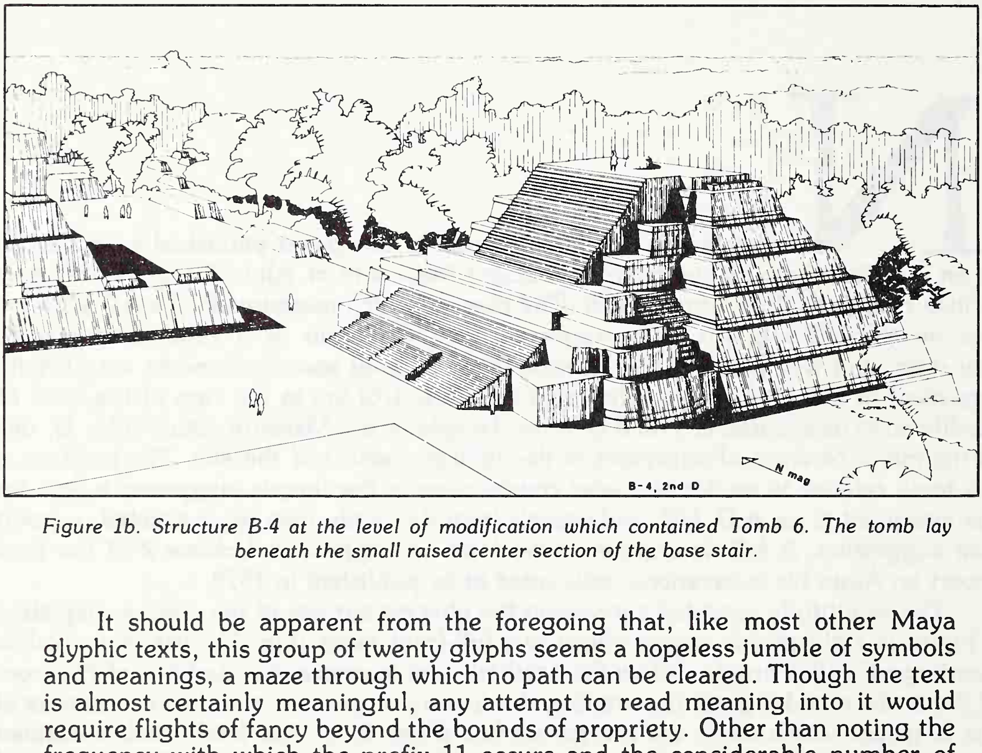

Figure 1b. Structure B-4 at the level of modification which contained Tomb 6. The tomb lay beneath the small raised center section of the base stair.

It should be apparent from the foregoing that, like most other Maya glyphic texts, this group of twenty glyphs seems a hopeless jumble of symbols and meanings, a maze through which no path can be cleared. Though the text is almost certainly meaningful, any attempt to read meaning into it would require flights of fancy beyond the bounds of propriety. Other than noting the frequency with which the prefix 11 occurs and the considerable number of celestial symbols present, it seems to me preferable to leave speculation regarding the significance of the text until such time as our knowledge of the meanings of the glyphs, as well as the workings of the system, has increased.

As will soon be apparent, the time mentioned in that pessimistic paragraph is now upon us. This is due in large part to the fact that there has been a steady advance in Maya hieroglyphic research since 1969, and also to the existence of a finished draw-

ing of the plaque, from which the glyphs can be read far more easily than was possible with the drawings available at the time the original article was written. The new drawing likewise makes it possible to recognize some elements on the obverse surface of the plaque which were obscured by flaws in the stone, and not clearly shown in the earlier drawing. Most important among these is a small human figure reclining atop the tree-of-life behind the main personage, his face lying at the upper left corner of the scene. But it is not the purpose of this paper to re-examine the obverse carving;

Figure 2. The Altun Ha Jade Plaque.

Figure 3. The Altun Ha Jade Plaque. Photo of Back.

rather, we wish to present an interpretation of the glyphic text, as an illustration of the strides made in Maya epigraphy since the time of Pendergast's original article.

The twenty glyph blocks are to be read in the normal Maya manner, left to right and down the double column. From the presence of two dates in the text, we can divide the inscription into two clauses, the first comprising blocks A1 - A4, and the second B4 - B10. The presentation below follows the format of the 1969 article, treating the text block by block, but adds a new dimension in the form of discussion of each clause as a whole. Glyph identifications which precede the glyph block discussions utilize the notation system of J. Eric S. Thompson (1962).

Clause 1 (A1-A4)

A1 - B1) VIII.506:125/VII.109:552 "8 Kan 7 Zip"

All these elements are very clear. The placement of this date in the Maya Long Count will be discussed later.

A2) 126??.190.181

In modern Maya clause structure, the verb is normally the first element. It is now well established that this was also the case in Classic Maya times, for all the verbs that have been securely identified in the inscriptions ("birth," "accession," "death," etc.) are usually first in their clause, immediately following the date. It is therefore reasonable to expect that this glyph at A2 is a verb. This view is strengthened by the probable presence of postfix T181, which is commonly regarded as a verbal suffix indicating a past tense form. The 'main sign,' T190, is an axe.

In several passages in the Madrid Codex an almost identical glyph can be seen in an apparent verbal context. In M96d there are four separate clauses; the first two are of three glyph blocks each, read vertically, and without accompanying picture. The third and fourth are of four blocks each, and each has an accompanying picture of a god fashioning a wooden mask. In the fourth clause, the first glyph appears to be exactly the same as that at A2 on the Altun Ha plaque. On page 97a of the Madrid Codex, the same glyph begins all three clauses, although in the pictures below no axe is visible. On page 97b a similar, but not identical, glyph begins all three clauses, and the axe is visible in the pictures below. It thus appears that this glyph can function as a verb related to the fashioning of wooden masks.

However, another interpretation is possible. Thompson (1966:6) gives examples of compounds with *bat* (*baat* means "axe" and is the reading which Thompson given to T190) referring to war. So a reference to war is at least indirectly supported here, and the event may well be a conquest by the personage whose name follows. This latter interpretation is somewhat strengthened by the reading given below for glyph A4.

B2) 228?.78?:513?.181?

Although only one of the constituent signs of this glyph can be fairly securely identified (the prefix T228), the glyph is in the position where the name of the protagonist of the clause is to be expected. In other words, this is the personal name of the man who is the subject of the verb at A2. The prefix, T228, is the third of Landa's *a*'s (Tozzer 1941: 170), and is substitutable with T12, which can be read *ah*, following Knorozov (1955: 26). Clearly the two signs are related semantically, if not phonetically. Since the sign almost exclusively precedes names and titles (as it does here), the reading *ah* is a good possibility for T228, as *ah* is in most Maya languages a prefix denoting agent. The main sign is possibly T513. It is unclear whether the remaining detail is one sign or two. If two, T78 is likely as the superfix and T181 as the postfix, although T181 is rare in name glyphs.

In sum, all that can be said with certainty about this glyph is that it is the name of the subject of the verb at A2, and that this interpretation is supported by the presence of the prefix *ah*.

A3) 11.526:246 *u-cab* (or cognate form), "the second"

The prefix is T11, a functional equivalent of T1, which is generally accepted as the third person possessive pronoun *u*, "his, hers, its, theirs." Whether the equivalence is phonetic as well as semantic is not yet established. The main sign is clearly

the same as the *Caban* day-sign, and there is good evidence for reading it ''*cab*'' in at least some non-calendrical contexts. *Ru-cab* is Quichean for ''second'' (the *ru* of Quiche is equivalent to Yucatec *u*). In view of this, it is interesting to note that the glyph is often recorded as the title of the second oldest son when he succeeds father and elder brother as ruler. Whether or not this is the correct interpretation of the glyph, it is clearly a title of Maya rulers. David Kelley has already argued that T1.526:246 be read *u-cab* and regarded as an ''appellative'' glyph (Kelley 1962:324, Fig. 4).

B3) 671[544].116 *chikin* ''west''

The main sign is the *manik* hand, and can be given the phonetic value *chi/che*. It has the *kin* sign, T544, infixed, and a postfix read as syllable final *-n*. Hence as a whole the reading is *chikin*, which means ''west.'' The directions often occur in title contexts, where the general sense is ''lord (or some other title) of the west (or other direction).'' Some examples, with the direction west, are shown in Figure 4. On the Altun Ha plaque; the usual accompanying titles are not present, but there is a good possibility that the following glyph, A4, is a title.

A4) 109.299:548:126 *chac pax*, ''great *pax*''

This is the last block of the first clause, and most likely accompanies the ''west'' glyph at B3. The main sign is clearly *pax*, although Thompson's *Catalog* (1962:164)

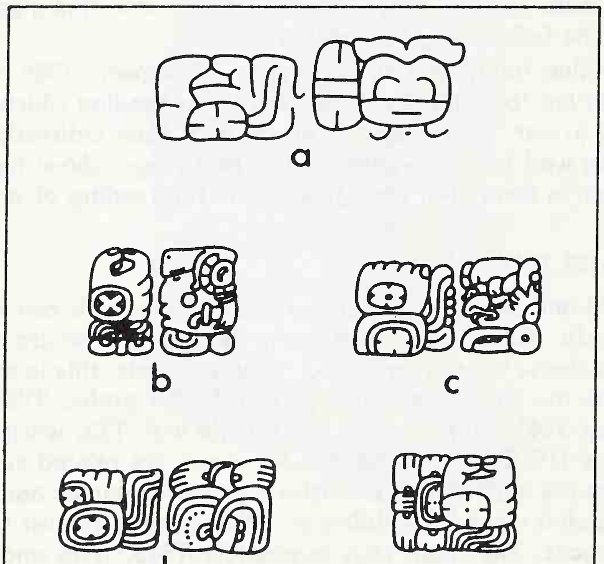

Figure 4. ''West ---'' Titles.
a. ''West chac pax.*'' Altun Ha Jade Plaque, B3-A4.*
b. ''West ahau.*'' Quirigua Stela F, East, B17b-A18a.*
c. ''West 'batab'.*'' Yaxchilan Lintel 1, H2-I2.*
d. ''West 'macuch'.*'' Naranjo Stela 24, E9-D10.*
*e. ''*Mah k'ina *of the west.'' Palenque area panel.*

has no entries of *pax* in a non-calendrical context. Especially in view of possible interpretations of the verb of this clause, it may be significant that Landa (Tozzer 1941: 165) mentions a five-day martial festival during the month *Pax*, culminating in the *holcan okot*, "the dance of the warrriors," also called the *batel okot*. The warlike aspect of this title is further supported when one considers that *chac pax* is glossed "war drum" in at least one Yucatec Maya dictionary (Pio Perez 1866-1877: 66). The prefix (T109, *chac*) is no doubt to be read here in its meaning of "great" rather than "red."

Clause 2 (B4 - B10)

B4) 11.573a:12

This is the so-called "Distance Number Introductory Glyph" of Thompson (1950: 160-162). However, in several examples (and this is one of them), there is no Distance Number associated. Thus, while the glyph usually precedes Distance Numbers, its function is clearly more general; apparently it serves to introduce any 'count' glyphs, including Calendar Round dates such as the one which follows here.

A5 - B5) VII.526:125/V.559:130? "7 Caban 5 Kankin"

Again there is no doubt about this Calendar Round date. Its placement in the Long Count is discussed below.

A6) 11.24?:713a.181

This is another event glyph, or verb, and inscriptions from other sites have to be reviewed as a basis for its interpretation. There are three other known examples of this glyph, one each at Palenque, Quirigua, and Yaxchilan (Fig. 5).

At Palenque (Fig. 5b), the event concerns 'Lord Hok' (Mathews and Schele 1974: 66-67). This lord is said in other Palenque inscriptions to have acceded to power on 9.13.10.6.8 5 Lamat 6 Xul. Since this is also the date of the clause at Palenque which contains the verb under discussion here, and since Lord Hok is named as protagonist, it is obvious that the verb must be a variant form of the statement for "accession."

The same glyph occurs on Stela J, Quirigua, as the verb for the clause dated 9.14.13.4.17 12 Caban 5 Kayab, where 'Two-legged Sky' is the protagonist (Fig. 5c). David Kelley has suggested that the verb is a functional equivalent of the 'up-ended frog' birth glyph (Kelley 1962: 327-328). However, this does not now seem to be the case. On Stela D (west side, A1-A9) at Quirigua, the Initial Series date is 9.16.13.4.17 8 Caban 5 Yaxkin—exactly two katuns after the Stela J date. 'Two-legged Sky' is again the protagonist, and the clause can be paraphrased "completion of two katuns [since] the accession of 'Two-legged Sky'," with "accession" marked by the 'affix cluster' found so frequently after the 'seating' and 'toothache' glyphs for accession at Piedras Negras by Tatiana Proskouriakoff (1960: 469-470). Moreover, Zoomorph G at Quirigua (Y2 - Z2) records the important date 9.14.13.4.17 12 Caban 5 Kayab, again with 'Two-legged Sky.' The main sign of the verb (Y2a) is eroded, but it has the affix (actually a portmanteau for two affixes) which often occurs with the 'seating' glyph for accession. That the glyph at Y2a was indeed the seating glyph is indicated by the following glyph, which is Proskouriakoff's 'affix cluster' of accession. An excellent case can thus be made for this date being the accession of 'Two-legged Sky,' rather than his birth, as Kelley suggested.

The Yaxchilan example of this verb is on the HS 3 (tread on the upper step of the middle doorway of Structure 44) (Fig. 5d). There is no evidence from the Yaxchilan

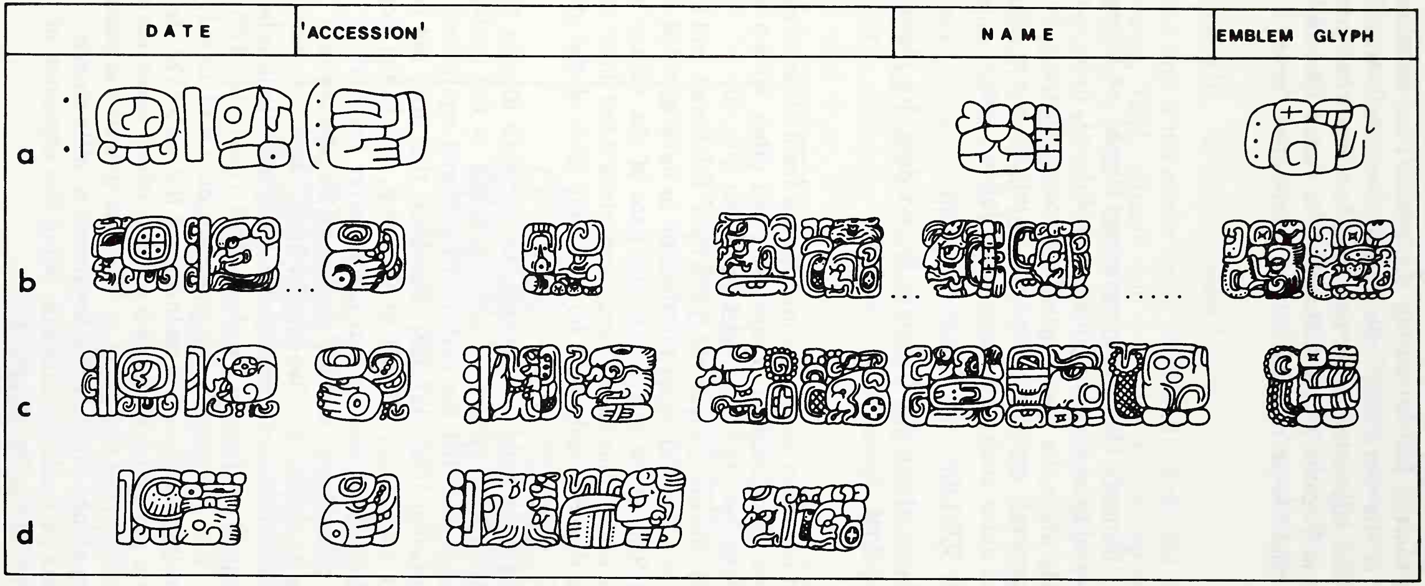

Figure 5. Accession Expressions.
- *a. Altun Ha Jade Plaque, A5-A7.*
- *b. Palenque Palace Tablet, M15-P12 [some glyphs have been omitted for reasons of space].*
- *c. Quirigua Stela J, F3-F8.*
- *d. Yaxchilan H.S. 3 [Structure 44, Middle Door, Upper Step, C10-C13].*

inscriptions that makes it mandatory that the verb of the clause be read ''accession,'' but the clause parallels the Quirigua Stela J statement, and the conclusion is obvious. The ruler involved is 'Shield-Jaguar.' In her important study of the Yaxchilan inscriptions, Proskouriakoff (1963: 155) found no clear accession statement for 'Shield-Jaguar,' but it is noteworthy that she suggests that he must have come to power about 9.12.8.14.1, and certainly by 9.12.10.0.0. The accession date proposed here—namely, 9.12.9.8.1 5 Imix 4 Mac— is almost exactly halfway between these two.

On the basis of comparisons with the occurrences discussed above, the verb at A6 on the Altun Ha plaque can safely be interpreted as "accession," and the name of the new ruler can be expected to follow.

B6) 175?:504variant.184 ____ *k'ina*, ''--- lord''

Apart from the fact that in Maya clause structure the name of the protagonist is to be expected immediately following the verb, there is another reason for regarding this glyph as a personal name. It will be seen that the next glyph, at A7, is an Emblem Glyph, and personal names almost always precede Emblem Glyphs. This interpretation of B6 is further supported by the presence of affix T184, which is part of the honorific title read by Floyd Lounsbury (1974) as *mah k'ina*, which can be roughly translated ''lord.'' The usual form of the affix is T74.184, as a prefix, but there are several examples at Palenque (where the compound is most common) which record only T184; the T74 is clearly an 'optional extra.' T184 alone presumably is to be read *k'ina*; this form is also documented in Colonial-period dictionaries as a title. At many sites (Copan, Quirigua, Tikal, Naranjo, Caracol, Yaxchilan—see Fig. 6), postfixing the compound seems to have been the preference; this is also the case at Altun Ha. Unfortunately, the two nominal signs here are unclear. The prefix looks most like the so-called 'Two-legged' (T175) of 'Two-legged Sky' of Quirigua. The main sign appears to be T504, *akbal*, with a cleft top. A suitable nickname for the ruler could thus be '*Akbal* lord,' with no implication that the first part of his name is an accurate reading.

It will be noted that the name of the protagonist of the second clause is not the same as that of the first. This does not necessarily mean, however, that the two were different people, for apparently it was not unusual for a ruler to take a royal name at accession. Many of the Palenque rulers, for example, had different names before and after their accession. Thus it may be that this ruler's personal name is the one at B2, but that upon accession (at 7 Caban 5 Kankin) he adopted a royal name. This speculation is somewhat enhanced by the presence of the honorific T184, *k'ina* in the proposed 'royal' name.

A7) 35.168:578?.116 (Emblem Glyph)

There is absolutely no doubt that this is an Emblem Glyph as defined by Heinrich Berlin (1958). It has both of the affixes diagnostic of Emblem Glyphs, namely one of Thompson's (1950, Fig. 43) 'water group' prefixes—in the present case T35—and the T168 superfix. The latter is the superfix which Thompson (1950: 281) originally read *ben-ich*, later as *ah* (Thompson 1972: 151). More recently Floyd Lounsbury (1973) has amassed overwhelming evidence that it is to be read *ahpo*, ''chief, ruler.'' The postfix to the main sign is clearly T116, the syllable-final *-n* discussed briefly above (B3); this clearly indicates that the reading of the main sign ends in *-n*. The main sign itself is a scroll; T576, 577 and 578 are all candidates for its identification, as well as T856.

What may be the same Emblem Glyph occurs on monuments from the Dos Pilas area (Dos Pilas, Arroyo de Piedra, Aguateca, Tamerindito) in Guatemala. It appears that there may have been a site in that area in Early Classic times with an Emblem Glyph identical with, or at least similar to, the one on the Altun Ha plaque. In view of

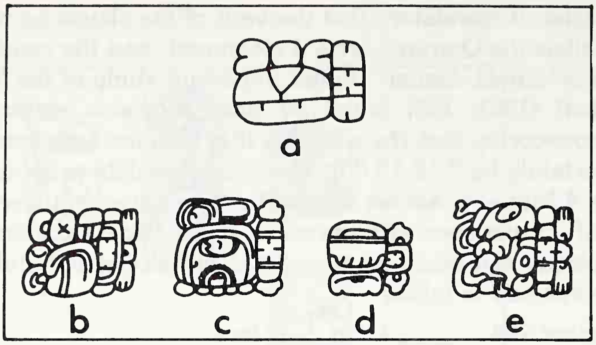

Figure 6. Glyphs with (mah) k'ina *as suffix.*
a. Altun Ha Jade Plaque, B6.
b. Naranjo Lintel 1, F3.
c. Tikal Stela 5, A7.
d. Yaxchilan Lintel 2, J2.
e. Aguateca Stela 1, D3.

this and the fact that the jade is obviously a portable object, the possibility that the plaque was an import from the Dos Pilas area cannot be ruled out. Nevertheless, this is far from established, and the extensive tradition of jade-working at Altun Ha may argue for identification of the plaque as a locally-produced object. In any case, it is not even certain that the Emblem Glyphs from the Dos Pilas area and Altun Ha are in fact the same, and so we can tentatively regard the Emblem Glyph at A7 as that of Altun Ha.

B7 - B10)

This statement must be considered as a whole before the single glyph blocks can be discussed adequately. A pattern similar to the statement can be seen in texts from almost all Classic Maya sites, in which the order is: (Date) (+ Event [Verb]) + Name 1 (+ Emblem Glyph 1) + glyph at B7 + Name 2 (+ Emblem Glyph 2) + glyph at A10 + Name 3 (+ Emblem Glyph 3). In other words, we find a pattern with only one event expressed, but three names mentioned. It is possible that the statement has to do with three people performing a single action, but is far more likely that it is an expression of some sort of personal relationship. This likelihood is strengthened by the fact that the name (2) following the B7 glyph is always female, while that following the A10 glyph (Name 3) is always male. Where we have adequate dating information, personages 2 and 3 can be shown to be older than personage 1 by about a generation. This enables us to hypothesize that the statement is one of parentage, with the glyph at B7 representing a mother-child relationship, and that at A10 a father-child relationship.

There is far more to the argument than can be presented here; other relationship glyphs, for example, can substitute for the ones at B7 and A10 of this text. A detailed discussion of 'parentage statements' in the Classic Maya inscriptions is the subject of a paper currently being prepared by Linda Schele, Floyd Lounsbury, and Mathews. Three such parentage statements are illustrated in Fig. 7.

B7) 126.19:670:??

This is one of the glyphs which expresses the relationship between mother and child (or either sex). However, it is still unclear whether the statement is to be interpreted as:

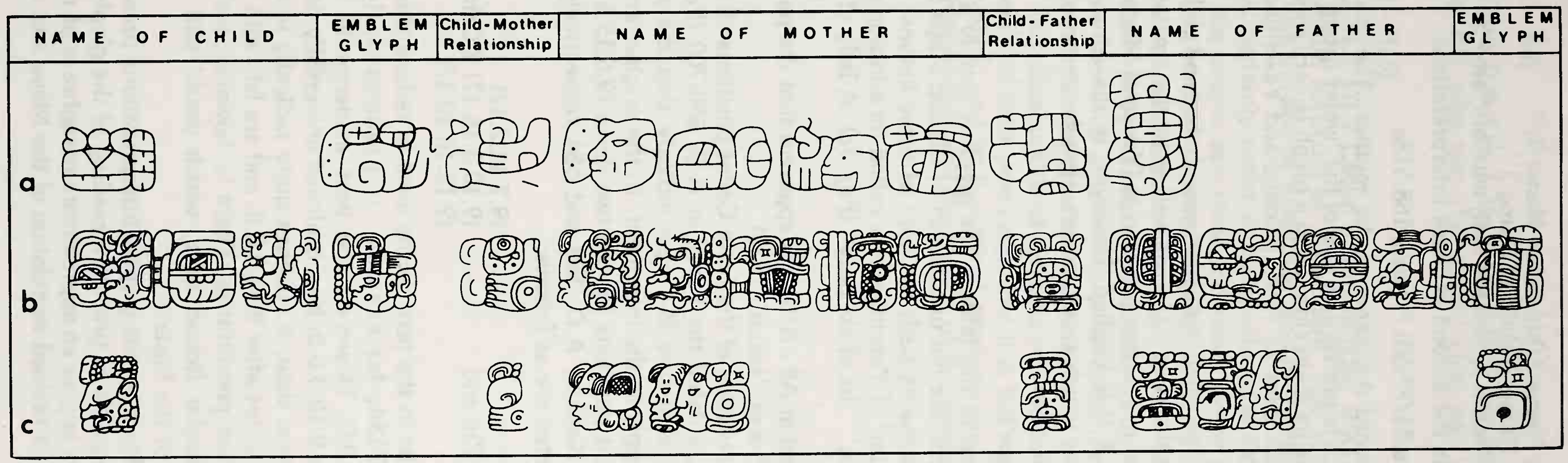

Figure 7. Parentage Expressions.
a. Altun Ha Jade Plaque, B6 - B10.
b. Tikal Stela 5, C5 - D12.
c. Yaxchilan H.S. 3 (Structure 44, Middle Door, Lower Step, B4b-A7a).

"Name 1/his mother Name 2/his father Name 3;"
or "Name 1/child of Name 2/child of Name 3";
or "Name 1/child of Name 2, (who is the)/wife of Name 3."

Present evidence suggests the second of these interpretations.

A8 - B9) 35.1002a/561a.24/??:501?. head/168:518a

These four glyphs record the name of the mother. The main sign of A8 is the female head T1002a, which is prefixed by one of the 'water group' prefixes, T35. B8 is a compound with "sky" as its main sign. Such a glyph is very common as the name or title of royal women at such sites as Tikal, Naranjo and Yaxchilan.

A10) 122.535.24

This glyph expresses the relationship between father and child. In most cases the 'capped ahau,' T535, is prefixed by T1, *u*, as well as by the smoke scroll T122. Since *u* is the third person singular possessive pronoun in (Yucatec) Mayan, the sense "A, his child B," i.e., "B's child A," is implied. However, in the Altun Ha plaque example there is no *u*—an omission which rarely occurs elsewhere—so other possibilities for interpretation must be left open.

B10) 28:1031c "*Katun*"

This must be the name of the father. The glyph is simply a *katun* head variant. Such chronological elements are not uncommon in Classic Maya name glyphs; in title phrases, at any rate, statements such as "lord of three katuns" are not at all rare. The father of 'Shield-Jaguar' of Yaxchilan was called (in addition to his personal name 'Bird-Jaguar') "*ah* -6 tuns," "he of six tuns" (Fig. 7c). A lady of Piedras Negras was called "Lady *ahpo katun*."

On the basis of the text at A8 - B10, it is apparent that the parents of '*Akbal* lord' were 'Lady Sky' (A8 - B9) and "*katun*" (B10).

There remains the discussion of the Long Count positions of the two dates in this inscription. Pendergast has dated the burial at A.D. 650-700 (Pendergast 1969: 86), but additional data from Structure B-4 now indicate that the earlier of these two figures is most likely to apply to the interment. In the original article, he provides as the most likely Long Count positions for the two dates (9.6.15.6.4) 8 Kan 7 Zip and (9.7.11.2.17) 7 Caban 5 Kankin, A.D. 569 and 584 respectively. Reasonable Long Count positions for the dates are as follows:

(9.6.15.6.4)	(9.7.11.2.17)
(9.9.8.1.4) 8 Kan 7 Zip and	(9.10.3.15.17) 7 Caban 5 Kankin
(9.12.0.14.4)	(9.12.16.10.17)

The style of the glyphs in the text can be used to reduce these possibilities. The lack of T74 affixed to T184, for example, is predominantly an Early Classic phenomenon—pre-9.10.0.0.0. However, the best evidence is in the form of the day-sign Kan (A1). Before 9.10.0.0.0, Kan is almost universally depicted in the form it has on the plaque; after that date, it changes quite radically in style. Therefore, we can fairly safely eliminate dates after 9.10.0.0.0, and are left with the dates suggested in the 1969 paper as the best possibilities. There is, however, a chance that the dates should be placed on Calendar Round later, which would still not be inconsistent with Pendergast's dating of the burial.

As the reader can judge from the glyphic interpretations presented above, we are still a long way from being able to provide a reading of the glyphs in Maya. We are, however, now in a position to give an approximate paraphrase of the plaque text, with dates based on Thompson's revised correlation of the Maya and Christian calendars:

Clause 1 (A1 - A4)

On (9.6.15.6.4) 8 Kan 7 Zip [May 2 (O.S.) or May 4 (N.S.), A.D. 569] the personage (at B2) who was the second *chac pax* of the west, made a conquest (?)."

Clause 2 (B4 - B10)

"On (9.7.11.2.17) 7 Caban 5 Kankin [Dec. 2 (O.S.) or Dec. 4 (N.S.), A.D. 584] the accession occurred of '*Akbal* lord' (the ruler named at B6) of Altun Ha (?), who was the son of 'Lady Sky' and of '*Katun*'."

We shall almost certainly never know whether the dates given in the text were the actual times of the events described, or points in the calendar which were ceremonially determined. The date situation here is standard, in that when two dates are recorded in a Maya inscription with no Distance Number to link them, it is usual that the second follows the first by less than a Calendar Round of 52 Maya years. In any event, the later date provides a *terminus post quem* for the manufacture of the plaque, and the sense of the text to which the dates refer is now clear. This is a far cry from Pendergast's "hopeless jumble of symbols and meanings, a maze through which no path can be cleared" of nine years ago, and it is but one of many examples of the ways in which epigraphic and archeological research are combining to give us new insights into the achievements and the history of the ancient Maya.

—1979

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20

The Mixteca-Puebla Concept in Mesoamerican Archeology: A Re-Examination

by H. B. Nicholson

There is an increasing emphasis in New World archeology on a more precise conceptualization of the vast mass of raw excavational data which has accumulated in recent years. Although a tremendous amount of basic fact-gathering remains to be done, it is recognized that for continuing progress in the field a constant refinement of our methodological and theoretical tools is equally necessary. Occasionally it is also worthwhile to re-examine and, when called for, to reformulate established concepts, particularly where these have been employed somewhat loosely. It is the aim of this brief paper to re-examine and to present suggestions for tightening one such formulation which has had a considerable influence in recent Mesoamerican archeology, the Mixteca-Puebla concept.

Vaillant, in three important studies published between 1938 and 1941 (Vaillant 1938, 1940, 1941) created this construct as a by-product of his attempt to erect a general interpretational scheme for the prehistory of Mesoamerica, with special reference to central Mexico. Boiled down to essentials, Vaillant visualized the development and crystallization of what he variously termed a "culture," "civilization," or "culture complex" in the region of Puebla (especially at Cholula) and the Mixteca of northwestern Oaxaca immediately following the Teotihuacán period, during the "Chichimec" interregnum in the Valley of Mexico. He saw it as diffusing into the Valley, especially at Culhuacan, and providing "the source and inspiration of Aztec civilization" (1941:83). He also believed that elements of this "culture" were carried throughout Mesoamerica, from Sinaloa in the north to Nicaragua in the south, chiefly by actual migratory movements. So important did he view this impact that he labeled his fifth and final major time division of pre-Hispanic Mesoamerica the "Mixteca-Puebla Period" (1941:Chart 1).

Vaillant never presented a systematic exposition of his concept, but in two brief passages he indicated in general terms its major elements: a carefully defined polytheism, the *tonalpohualli*, 52-year cycle, stylized picture writing, chiefly lineage, formal war, and "characteristic ceremonial practices" (1940:299; 1941:84). As sites, areas, and phases which displayed characteristic Mixteca-Puebla influence, apart from late central and southern Mexico in general, he specifically singled out Guasave in Sinaloa, Xochicalco, the Cerro Montoso phase in Veracruz, "the Mexican occupation of Chichén Itzá," Santa Rita in British Honduras, Naco in Honduras, and Guatemala, Salvador, and Nicaragua generally. In addition, he felt that "elements of the religion affected tribal communities as far distant as the southeastern United States" (1941:84).

Applying it to their own findings, Vaillant's Mixteca-Puebla concept was soon accepted by other archeologists. One of the first was Ekholm, who, in his 1942 Guasave report, used it to clarify the source of an important influence in the Aztatlan complex of Sinaloa (Ekholm, 1942:126-131). In the same year the second Mesa Redonda of the Sociedad Mexicana de Antropología adopted a scheme recognizing four major horizons in Mesoamerica, for the last of which they utilized the label Mixteca-Puebla (Mayas y Olmecas, 1942:76). Since then the term has passed into common terminological currency. Subsequent to its original formulation, however, the concept has not been the subject of any significant re-analysis. This is all the more surprising in view of a major shift in orientation toward the "Toltec problem" which occurred in the very year that Vaillant's final presentation of the concept appeared and which has since led to the rejection of much of that portion of his scheme which concerns the Teotihuacán-"Toltec" and "Chichimec" periods.

I refer to the Instituto Nacional de Antropología's excavations at Tula, Hidalgo, under the direction of Acosta (beginning in 1940), and the first Mesa Redonda of the Sociedad Mexicana de Antropología, 1941, where it was almost unanimously agreed, after some spirited debate, to effect a final divorce between Teotihuacán and the Toltecs of the traditions. This re-orientation resulted in a recognition that Vaillant's "Chichimec" period (typified ceramically by Mazapan, Coyotlatelco, and Culhuacan-Aztec I) falls almost wholly within the newly defined Toltec period, during which Tula played a dominant political and cultural role in central Mexico. Since Vaillant has classified "Mexican" Chichén Itzá as Mixteca-Puebla, the nearly identical parent style of Tula necessarily also fits within his concept. But the picture revealed by the Tula excavations is quite distinct from that drawn by Vaillant, i.e., of a Mixteca-Puebla movement into the Valley of Mexico during a kind of Chichimec time of troubles. Instead, if his chronology on this diffusion is accepted, it would have occurred some time during the Toltec period, in conjunction with the development of the "Mixteca-Puebla" Toltec style itself further to the north. Vaillant's hypothesis of a Pueblan origin for "Aztec civilization" is also greatly weakened by this new alignment, for the essentially Toltec background of the latter is constantly receiving more confirmation.

Do these difficulties caused by our somewhat clearer understanding of the period between the end of Teotihuacán and the rise of Tenochtitlan force the conclusion that Vaillant's Mixteca-Puebla notion has lost its conceptual utility? I think not, but I also believe that a certain amount of reformulation is necessary. The remainder of this paper will be devoted to a consideration of the kind of reformulation which seems to be required by the evidence.

As noted above, Vaillant interchangeably employed the terms "culture," "civilization," "culture complex," and "period" for his concept. Later students added the

term "horizon." This terminological variance has led to both ambiguity and confusion. The first two labels seem much too broad to be conceptually useful. The third perhaps has more justification but still appears poorly applicable to the type of data out of which Vaillant erected his construct. The last two describe the concept in terms of a temporal framework; a brief comment will be made on this below.

Analysis reveals that what Vaillant and his followers really have in mind when they employ the term Mixteca-Puebla is, above all, a distinct *style*. Thus when Vaillant speaks of "Aztec civilization" entering the Valley of Mexico at Culhuacan, he actually means that a style of ceramic decoration, out of which evolved the later dominant Valley pottery tradition (Aztec II-IV), seemingly first appears at this site (as Aztec I). Vaillant's other elements, listed above, are not particularly useful criteria, being too widespread temporally and spatially. For example, most, conceivably all, of these traits may have been present, at least to some degree, in both the Classic period Teotihuacán and Monte Alban configurations. Phrased in essentially stylistic terms, however, the Mixteca-Puebla concept can still serve a useful purpose, particularly as a chronologic marker.

What are some of the leading features of the style which lend it distinctiveness? Within the brief compass of this paper, a thorough analysis and definition is impossible, but certain diagnostics can be outlined in a very preliminary way. Perhaps the best touchstone for a definition of the developed style is the Codex Borgia, which, considering its iconographic complexity, esthetic sophistication, and stylistic near-identity to the decorative devices of the local polychrome wares, was very likely painted in Cholula itself. Above all, the style at its best, as in this superb *bilderhandschrift*, is characterized by an almost geometric precision in delineation. Symbols are standardized and rarely so highly conventionalized that their original models cannot be ascertained. Colors are numerous, vivid, and play an important symbolic role in themselves. In general, there is much that is akin to modern caricature and cartooning of the Disney type, with bold exaggeration of prominent features.

These generalities, however, are much less important in distinguishing the style from others in Mesoamerica than certain specific ways of representing various symbols. The presence of even one of these symbols or a characteristic grouping is often enough in itself to define the presence of the style. Among the most highly distinctive individual symbols are: solar and lunar disks, celestial and terrestrial bands, the Venus or bright star symbol, skulls and skeletons (with double-outlined bones), jade or *chalchihuitl*, water, fire and flame, heart, war (*atl-tlachinolli*, shield, arrows, and banner), mountain or place, "downy feather ball," flower (many variants), stylized eyes as stars, stepped fret (*xicalcoliuhqui*), sliced spiral shell (*ehecacozcatl*), and the twenty *tonalpohualli* signs. One of the most frequent and diagnostic symbol groups is the row of alternating skulls and crossed bones (often combined with hearts, severed hands, etc.). Zoomorphic forms are quite distinctive and easily recognizable, particularly serpents (frequently feathered, *quetzalcoatl*, or sectioned, *xiuhcoatl*), jaguars, deer, rabbits, and spiders. The many deities depicted are highly individualized and usually accompanied by special, clearly distinguishable insignia.

The general style can be broken down into a number of regional and temporal variants. The Toltec sub-style is one of the most divergent of these and appears to lack many of the basic elements listed above. Most surviving Toltec relief sculptures and wall paintings (the ceramics rarely display representational or symbolic motifs) seem to deal with predominantly secular themes, although supernaturalistic features are commonly intermixed. If more strictly religious depictions were available, especially pictorial codices, similarities to the general style might well be increased (the rock

paintings of Ixtapantongo, State of Mexico (Villagra, 1954), probably provide a fair idea of how a sheet from a Toltec religious manuscript might have appeared). Another notable sub-style is what can be called the Valley of Mexico Aztec style, although its influence extended considerably beyond that range in the wake of the military conquests of the Triple Alliance. It is best typified by the Codex Borbonicus and most of the carved monuments unearthed in Mexico City. Although very close in both spirit and formal detail to the Cholulteca (= Codex Borgia) sub-style, it is marked throughout by greater realism. A third important sub-style is the Mixtec style proper, well-known from the large number of both pre- and post-Conquest codices which have been preserved from this region. It is extremely close to Cholulteca; certain minor but significant differences, however, probably justify its being distinguished. A number of other sub-styles could be delimited, notably that represented by the Codices Fejervary-Mayer and Laud, which perhaps originated in Veracruz (Cuetlaxtlan? The two codices sent by Cortes to Spain?), but space forbids further discussion.

Not only is the Mixteca-Puebla concept best defined in stylistic terms, it is an obvious candidate for one of the most significant recent concepts in New World archeology, the "horizon style." This useful construct, which originated in Peruvian prehistory, was given its first explicit formulation by Kroeber (1944:108), who defined it as a style ". . . showing definably distinct features some of which extend over a large area, so that its relations with other, more local styles serve to place these in relative time, according as the relations are of priority, consociation, or subsequence." The ideal horizon style is characterized by three principal features: (1) narrow temporal distribution; (2) broad spatial distribution; (3) stylistic complexity and uniqueness. In terms of Willey's "space-time systematics," horizon styles function as ". . . horizontal stringers by which the upright columns of specialized regional development are tied together in the time chart" (Willey, 1945:55).

Does the Mixteca-Puebla style qualify? Although it falls somewhat short of the ideal, it appears to satisfy the requirements well enough to be conceptually utilized as such. Perhaps its weakest aspect is its rather broad temporal range (in some cases apparently throughout most of the Post-Classic). Stylistically, in spite of numerous temporal and regional variants, it certainly possesses enough complexity and uniqueness to qualify. Its strongest aspect is probably its broad, though quite gappy, spatial distribution.

This latter has yet to be worked out in detail, but some of the most obvious and striking occurrences are worth noting. Apart from its heartland in the areas from which it takes its name and the immediately adjacent regions, especially the Valley of Mexico, it has been located: in almost classic form in the Aztatlan complex of Sinaloa; sporadically elsewhere throughout northwestern and western Mexico; in a distinct regional variant in the Huaxteca (particularly in stone sculpture, shell-work, and wall paintings); throughout the Veracruz littoral in styles often very close to Cholulteca ("Cerro Montoso," Cempoala, Isla de Sacrificios, Cerro de las Mesas Upper I-II, etc.); in Yucatan as the Toltec substyle at Chichen Itza and, in a later variant, as a clearly discernible influence on the wall paintings of Tulum; in the Santa Rita wall paintings, British Honduras (a particularly striking fusion of late Maya and Cholultecoid styles); somewhat weakly and sporadically in the ceramics of Chiapas, Guatemala (where the Cotzumalhuapan or "Pipil" sculptural style also displays certain generalized elements reminiscent of Mixteca-Puebla), and Salvador; and, possibly, as a pale reflection in certain varieties of Nicoya Polychrome in Nicaragua and western Costa Rica. In addition, wherever Plumbate or X Fine Orange is found throughout Mesoamerica, various Mixteca-Puebloid motifs occasionally appear. A thorough check of

all Mesoamerican archeological literature would doubtless fill in a number of gaps; further excavation, many more.

The temporal range of the style is bound up with the problem of the time and place of its origin. As of now, Vaillant's hypothesis of earliest appearance in Puebla and/or Mixteca still seems to be supported by the best evidence; certainly, as he justifiably stressed, it reached its greatest elaboration there. Ceramically, one of its earliest occurrences is in the "policroma laca" and black-on-orange wares of Cholulteca I-Altar de los Craneos, falling apparently near the base of the Early Post-Classic (coeval with Mazapan, Coyotlatelco, Culhuacan-Aztec I, etc.; Noguera 1937; 1954). The formative stages through which it passed, however, have not yet been clearly revealed, either at Cholula itself or elsewhere. Sculpturally, some of the motifs of the Xochicalcan style definitely foreshadow the developed Mixteca-Puebla style, particularly calendric symbols (I would hesitate to follow Vaillant, however, in classifying it as a Mixteca-Puebla sub-style). It seems likely that Xochicalco, in this as in other respects, may have served as a bridge between the older Teotihuacán-Monte Alban tradition and the newer Mixteca-Puebla stylistic age.

On the basis of present evidence, the following developmental hypothesis can be suggested: it is probable that, as both the Teotihuacán and Monte Alban traditions were sputtering out, a new stylistic synthesis was taking place (in which Xochicalco may have played an important role) somewhere to the east and south of the Valley of Mexico, possibly centered in Cholula. Meanwhile a parallel process of synthesis was developing further to the north, with Tula as a center. The two evolving traditions must have exerted considerable influence upon each other, particularly the southern upon the northern, which became in a sense a sub-style of it, although preserving a strong individuality. The two traditions seem to have met in the Valley of Mexico, where the Chalco region, particularly, displays striking southern ceramic affiliations. The creators of the southern synthesis, the Mixteca-Puebla style *par excellence*, can perhaps be identified, as Jiménez Moreno has suggested (1942:128-129), with the Olmeca-Xicalanca of the ethno-historic traditions (Historia Tolteca-Chichimeca, Muñoz Camargo, Chimalpahin, Ixtlilxochitl, *et al.*), who may have been the masters of a political empire rivaling and contending with that of Tula. With the break-up of this latter center, an outpouring of migrants, "civilized" Toltecs as well as "barbaric" Chichimeca, evidently overran the southern region. Far from obliterating its stylistic traditions, however, these newcomers appear to have readily accepted them, the Toltec groups probably fusing their own well-developed and similar stylistic canons with those they encountered. The southern tradition, therefore, continued with little basic change, as evolved Cholulteca and Mixtec, eventually strongly influencing the formation of a new Valley of Mexico synthesis, Aztec. All three were flourishing at the time of the Conquest. During both the Toltec and post-Toltec periods, waves of Mixteca-Puebla stylistic influence spread widely throughout Mesoamerica, some echoes perhaps reaching the southeast United States in the "Southern Cult" efflorescence. Although the extensiveness of this diffusion might seem to justify labeling this final Mesoamerican horizon Mixteca-Puebla, the term now coming strongly into use, Post-Classic, is unquestionably preferable, if for no other reason than the fact that the style had such varying influence in different regions, some apparently being affected little if at all.

This tentative reconstruction is only an attempt to modernize somewhat Vaillant's original stimulating hypothesis and, like his, will undoubtedly be significantly modified by further analysis and excavation. Certainly one of the most important tasks for the future is a more refined sequential breakdown of the basic style into successive

stages of development. This would probably eventually result in the formulation of at least two major sub-stages; these might be labeled, respectively, Mixteca-Puebla Horizon Style A (= Toltec period) and Horizon Style B (= post-Toltec period; ''evolved Cholulteca''). A promising minor lead in this direction, focusing on a single important stylistic element, the ray device of the solar disk, has already been briefly initiated by both Andrews (1943:75-76) and Caso (1956:173-174). A careful tracing of both the immediate antecedents of the style and its earliest formational stages is another important desideratum.

In summary: Vaillant's Mixteca-Puebla concept has been subjected to a brief critical analysis, necessitated particularly by the revision of important parts of the overall scheme in conjunction with which it was formulated. It has been suggested that its reformation in essentially stylistic terms would best preserve its conceptual utility. An attempt was made to define briefly the salient features of the style and to sketch preliminarily its spatial-temporal distribution. Its candidacy as an horizon style was also put forward, and it was felt that it fitted the specifications well enough to qualify in a broad sense. Lastly, further research designed to clarify its sequential development was urged, which, if successful, would greatly increase its value as a chronologic indicator.

—1960

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21

Reading the Riddle of Ancient Jewels

An Analysis of the Historical Significance of the Monte Alban Treasure —the Ritualistic Meaning of the Ancient Mixtec Inscriptions*

by Alfonso Caso

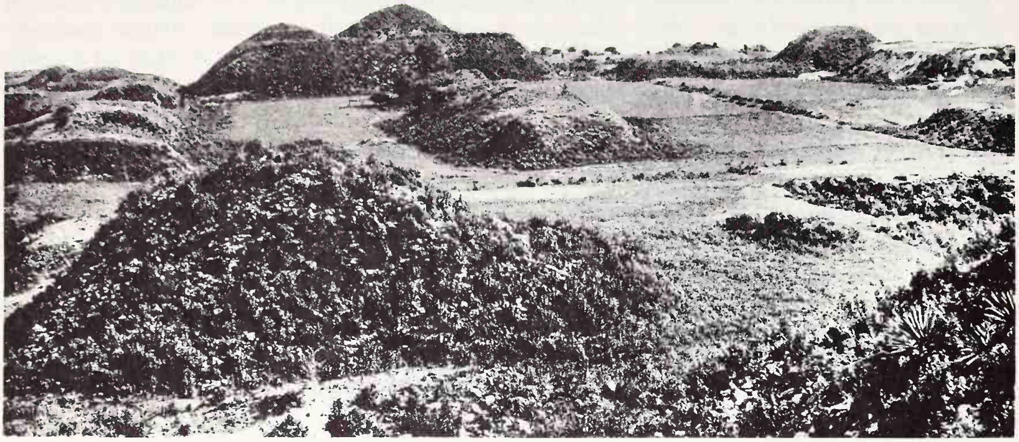
In a recent magazine article I gave a short preliminary explanation of the discoveries made at Monte Alban during the season of 1931-1932, under the patronage of the Ministry of Public Education, the government of the State of Oaxaca, the Panamerican Institute of Geography and History, the National University, and the Messrs. Morrow, Del Valle, Melgar, and Velazquez Uriarte.

I wish, however, in this present article to discuss a specific point, but one very important to the find: To what indigenous civilization do the objects belong?

But before entering into this discussion, let me briefly relate how we found the tomb and made the excavation.

The mound of Tomb 7 at Monte Alban lies immediately next to the western edge of the road which goes from Oaxaca to the place where the ruins are situated. This mound is very little elevated in relation to the general level of the soil, but it is located at the foot of a small hillock which is some four meters high and represents undoubtedly the substructure of a temple. On the other side of the road and in front of the tomb and the temple are the tombs numbered 3, 8, and 9. Next to Tomb 7 is another little mound which shows a depression and doubtless contains another tomb which I could not explore in this season's work, but which I intend to uncover in the next.

*Translated by S. B. and G. C. Vaillant



Wide World Photograph

The ancient ruins of Monte Alban, outside the City of Oaxaca, Mexico. The tombs uncovered here contained jewels and other relics of a civilization which flourished before the Spaniards came to America.

We began the exploration of the mound over Tomb 7 by cleaning off the upper part, encounting what seemed to be the remains of the walls of some small rooms located on top of the mound, the floors of which were covered by a thick coating of the stucco used in Monte Alban to surface walls, their sloping bases, stairways, and pavements.

In one of the newly discovered tombs, Professor Caso (left) and Martin Bazan, his assistant, are taking the measure of a copper pot near Professor Caso's right hand. In the foreground at the left are the bones of Mixtec chieftains with pearls resting beside them.

One of the most important characteristics of Tomb 7 was a little ditch approximately 20 cm wide by 6.85 meters long, situated exactly in the back part of the tomb, parallel to its transverse axis. (See plan on p. 262).

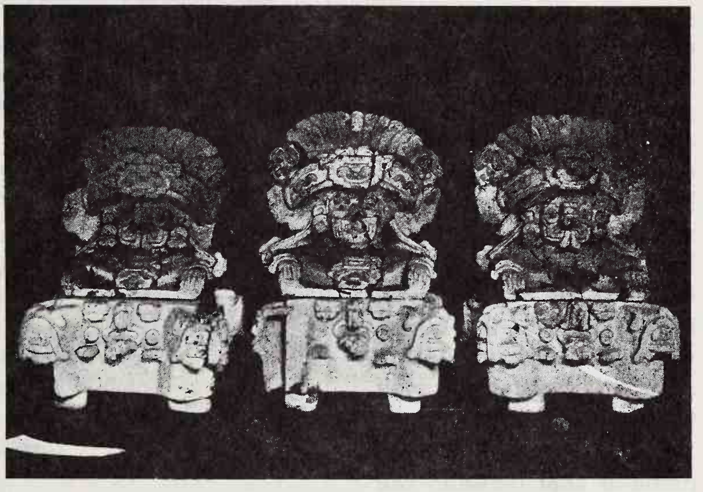
In opening up a vertical pit to find the tomb, we had to break through a second stucco floor, before we encountered the stones forming the vault. We removed two of these vault stones and were then able to descend into the tomb and to measure its interior length, with a view to finding the door. To do this, however, it was necessary to open another vertical pit before we reached a little antechamber, roofless and full of dirt, in which appeared, intentionally broken, three great Zapotec urns with their pedestals, shown restored in the figure on page 261. The

central one of these very common urns represents an old god, probably the god of fire, whom the Mexicans call Huehueteotl, and who in their mythology was the lord of the central region of the universe. The urns at either side are representations of the Zapotec god called Cocijo, who, as I have demonstrated elsewhere, is equivalent to the rain god, called Tlaloc by the Mexicans. (*El Vaso de Jade de la Coleccion Plancarte*. Revista Mexicana de Estudios Historicos. Vol. I, p. 7).

After carefully removing the urns and fragments, we were able to find the entrance to the tomb. It was closed by means of large stone slabs, and when we removed these we discovered that the door was almost completely blocked by a great heap of earth. Between the top of this earth and the lintel of the door there remained only a small opening, which we had to enlarge in order to penetrate to the interior.

None of the stones which sealed the entrance had inscriptions, but on the other hand, forming part of the vault of the antechamber and resting directly on the lintel, we found a stone with the inscription which appears on page 265, and which has about the same dimensions as the doorway, so that it is extremely probable that at first it occupied this position.

The inscription on this stone is indubitably Zapotec and I was able to read on it the year "serpent" and the day "flower," as well as the number 8, formed by a bar and three dots; but I could not say whether the sign ought to be attributed to the glyph "serpent" or to the glyph "flower," although the first seems to me more probable. Beneath the second of these signs there is a glyph which I do not know how to interpret, but it could be the number 4, united to the day sign.



Zapotec urns found in the entrance to Tomb 7. These mortuary vessels represent Zapotec gods. The center one is the Old God while at either side are effigies of the Rain God Cocijo. (See page 260.)

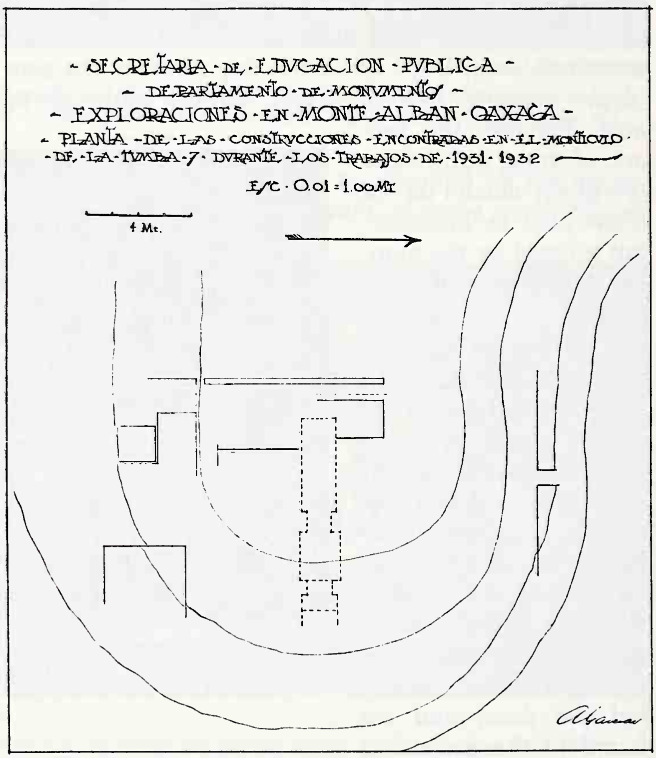
As can be seen on the plan of the tomb, in the longitudinal cross section shown on page 263, there was a layer of earth inside which varied greatly in thickness. In the second room, next to the end of the tomb, it had a depth of merely 30 cm, while at the entrance it almost hid the door, and we found in the projecting portions of the walls and the lintels, small heaps of dirt which indicated that the layer of earth originally reached that height and later, owing to settling, subsided a little until it left, as I have said, a small opening between its upper level and the lintel of the tomb.

Furthermore, after cleaning away the earth which covered the tomb and taking out the objects from the principal burial, there appeared underneath, small clay vessels, a fragment of a Zapotec urn like those found in the antechamber, and a piece of a metate. The little pots are just like those which I found in Mound B during the excavations there, and are of the type which has always been considered Zapotec.

Therefore it seems to me unquestionable that Tomb 7 in Monte Alban was used twice. The first burial was made directly on the floor of the tomb and was accompanied by the vases, metates, etc. which I have just described, and by the Zapotec urns. The door was sealed, probably with the stone which is now in the vault of the first room and which has the inscription of the year 8 "serpent" and the day 4 (?) "flower." Thus both the urns and the inscription show the first burial to have been Zapotec.

Furthermore, the very architecture of the tomb is Zapotec, like others which we found in Monte Alban and which Saville discovered in Xoxo and Cuilapan (M. H. Saville, *Exploration of Zapotecan Tombs in Southern Mexico*. American Anthropologist, n.s., vol. 1, pp. 350-362). The chambers of the tomb are roofed by the two methods which the Zapotecs used and which we might call plane vaulting and angular vaulting. The first consists of great smooth stones placed horizontally and resting either on the walls of the tomb, or, as in the case of Tomb 7, on stones like brackets which are used to sustain the roof stones. The first chamber was so roofed, as can be seen in the transverse and longitudinal cross sections on page 263.

The second chamber has an angular roof, formed by two inclined stones, as can be seen in cross section AB, on the diagram page 263. We find plane vaulting chiefly in cruciform tombs like those of Mitla and Tomb 3 of Monte Alban. Angular vaulting, on the other hand, is more characteristic of the tombs with niches, like all the others we discovered in Monte Alban in this first season of work.



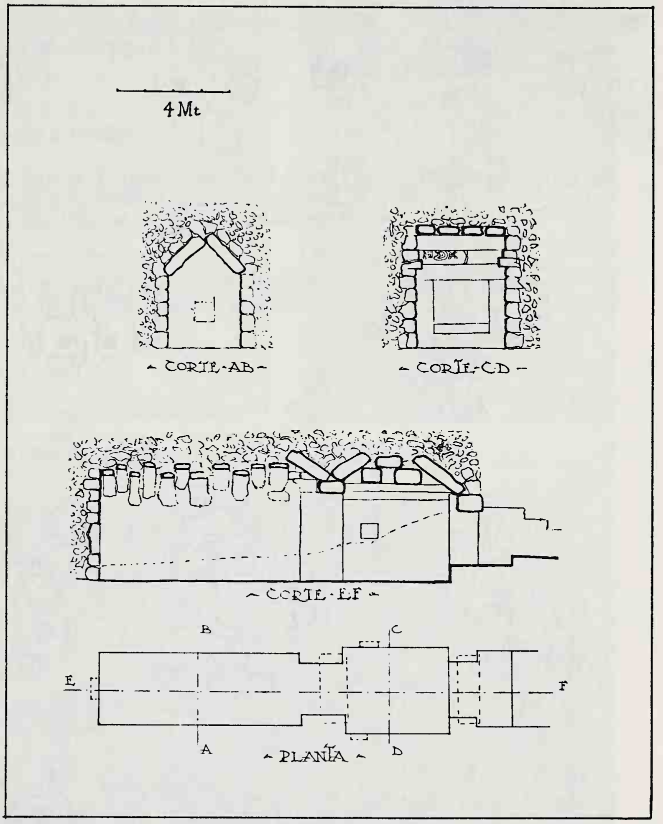
Plan of the mound covering Tomb 7. The dotted lines represent the plan of the tomb, while the solid straight lines show traces of walls. The irregular lines give the contours of the mound (see page 260).

It seems to me very probable that between the cruciform tomb and the tomb with niches there is a sequential relation. As a matter of fact the niches in the tombs are three, and are placed one at the end of the chamber and two in the walls. It might follow that these niches are survivals of the arms and the cross, or, if the tomb with niches is earlier, then they have become gradually more important, until they stand converted into the little rooms which form the head and the arms of the cruciform tombs. At the present stage of our knowledge, it is impossible to say if the first method of constructing the tombs was

the cruciform type or that with niches, but the two methods of construction seem to me to have a definite relation.

Before entering into the discussion of the objects of the later burial, I wish to define what I mean *archaeologically* by the term *Zapotec*. As I showed in my book *Las Estelas Zapotecas* (Zapotec Stelae), there is a great resemblance between the urns thus classified and the stones with inscriptions which have been found at Monte Alban and other places—Etla, Zaachila, etc.

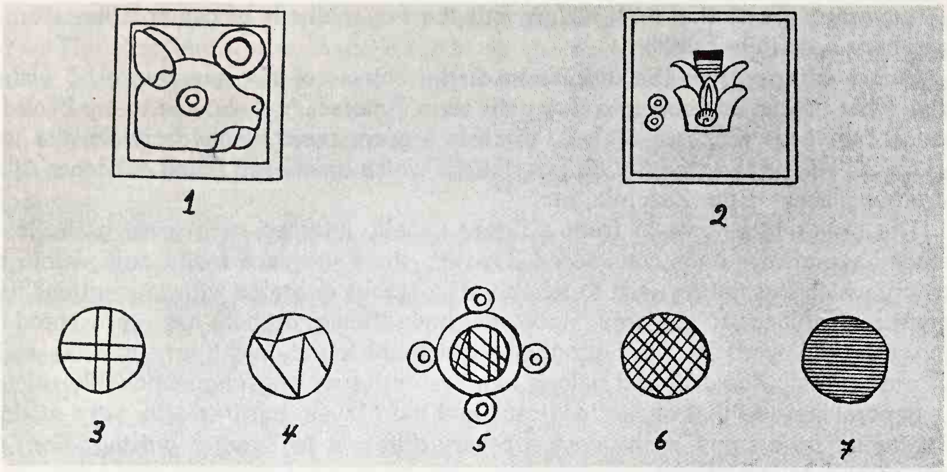
The urns which have in front a figure usually adorned with great panaches of plumes have always been considered Zapotec, since they are found only within the territory which this nation used to inhabit. The stones or stelae with inscriptions have a great resemblance to the urns, since, as I have shown, on both are represented the same gods and symbols. The hieroglyphs which are found on the urns and the stelae are consequently Zapotec, and belong to a system of writing unquestionably related, in a general way, to that of the Mexicans and the Mayas, but in reality very distinct. For example, the signs of the days are very different in Zapotec writing, from the Mexican and Mixtec. Even though I cannot yet give the order of the Zapotec hieroglyphs, the day signs appear on page 265. On the other hand, if Mexican glyphs are compared with Mixtec, it will be seen that they are the same, if one excepts the stylistic variations which characterize glyphs as Mixtec without altering their essential form. (Page 264.)



Plan and cross sections of Tomb 7. The dotted line EF marks the height of the earth in the tomb. On top of the earth were found the skeletons and jewels comprising the second (Mixtec) burial, and below, inside the earth, the objects of pottery and stone comprising the first (Zapotec) burial.

The year sign is different in all three: Mexican, Mixtec, and Zapotec writing, and probably also in Maya, but in this last case no year sign has yet been defined.

The Zapotec year sign is the face of the god Cocijo or Tlaloc, who has before his mouth a mask with serpentine attributes, in which the fundamental characteristic seems to be an ornament over the nose made by a disc and a trapezoid, which in the Mexican codices is the representation of the turquoise nose-plug. This adornment acquires greater importance as the glyph is simplified, so that I believe it must be the fundamental part of the sign. (Page 265.)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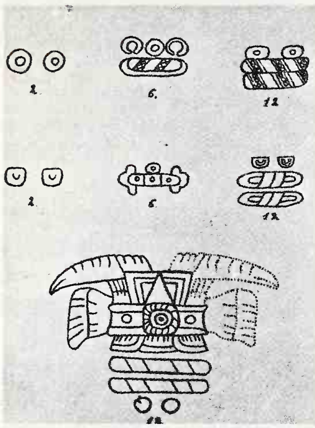

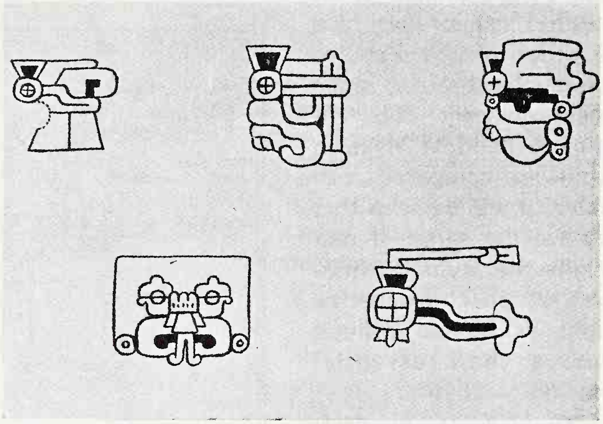

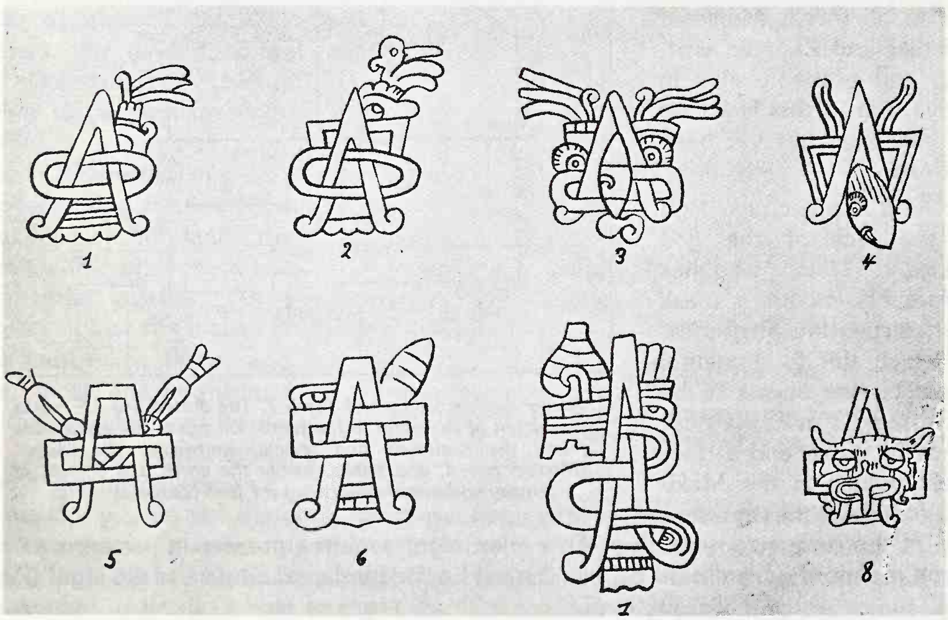
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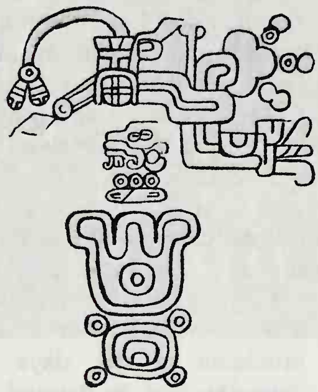
FIGURES ON THIS PAGE

Above. Mixtec and Mexican Day Signs (see pp. 263 and 268).



Right. Inscription of the stone now in the roof of Tomb 7, but which originally must have covered the entrance (see pp. 261-262).

Bottom. Zapotec Day Signs (see p. 263).

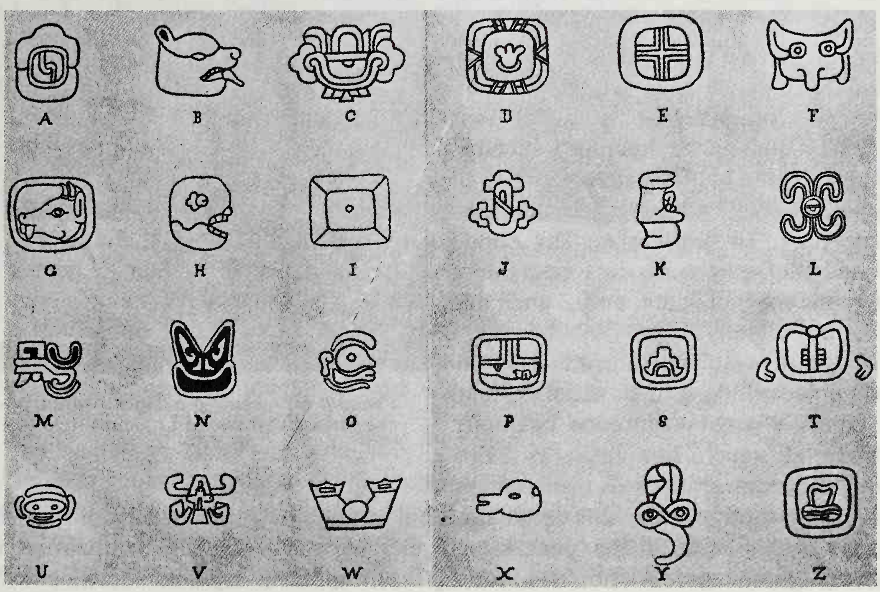
FIGURES ON OPPOSITE PAGE

Uppermost Plate. Mexican Year Signs: (see p. 266). 1. Teocalli of the Holy War. 2. Bourbon Codex. 3. Clavijero. 4. Aubin Codex. 5. Codex Matritense del Real Palacio. 6. Codex Vaticanus a. 7. Mendoza Codex.

Middle Left. Numerals, Top Row: Maya Numerals (see p. 266). Middle Row: Zapotec Numerals. Bottom Row: Glyphs on a Shell from Teotihuacan.

Middle Right. Zapotec Year Signs (see p. 263).

Lowermost Plate. Mixtec Year Signs (see pp. 263-266) 1 and 2. Colombino Codex. 3. Nuttall Codex. 4. Borgia Codex. 5. Selden Codex. 6. Bodley Codex. 7. Bodley Codex. 8. Vienna Codex.



In the Mixtec and Cuicatec codices and inscriptions, the sign of the year is a kind of interlaced A.O., although a trapezoid sometimes appears united to them (bottom, page 264). The A represents the solar ray such as we find in innumerable Mexican monuments, like the so-called Aztec calendar stone for example. The O, and the trapezoid which sometimes appears, represent the same symbol as is found in Zapotec writing, the turquoise in the nose of the god Cocijo. In some representations of this sign one or both of the god's eyes are still retained.

Among the Mexicans the year sign is different, since they usually indicated it by the glyph of the first day in the year, enclosed in a square, or by the turquoise. The Mexicans designated with one term, *Xihuitl*, both the year and the turquoise (top, page 264). The representation of numerals is also different, although we cannot here make as neat a distinction as in the preceding cases.

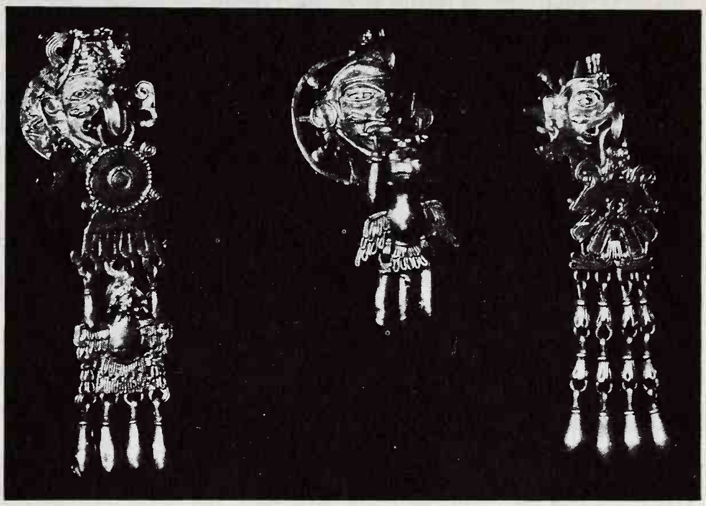
The Mayas, the Zapotecs, and the Teotihuacanos used dots to express numbers up to 5, and a bar or bars to represent 5 or multiples of 5, combining bars and dots for other quantities. (Page 264.) In no Aztec monument or codex do we find bars indicating 5, since they used dots to represent numbers as high as 13. On the other hand, in codices and monuments attributed to the Mixtecs we find both systems used; dots and bars combined in some, and in others only dots. Examples of the first are: the Laud, Cospi, and Fejervary-Mayer codices, and the stone of Cuilapan. As examples of the second we shal mention the Vindobonensis, the Nuttall, the Colombino, the Dehesa, etc., and several of the Borgia group as well. It should be noted that in the three codices where the dots and bars are combined—Laud, Fejervary, and Cospi—*the system of enumeration by simple dots also occurs*. The last is used for the coefficients of the days in the ritual calendar, and, in general, for any calculation of days. With the system of combined dots and bars, other calculations are made which cannot yet be deciphered. The Laud and the Fejervary codices do not seem like the Cospi to have been altered subsequent to the original writing, a fact which demonstrates that both systems could be used at the same time and by men of the same culture, in spite of the proven fact that the Aztecs never used the combination of dots and bars. To summarize: The Zapotecs used the system of dots and bars, the Aztecs that of dots only, and the Mixtecs both.

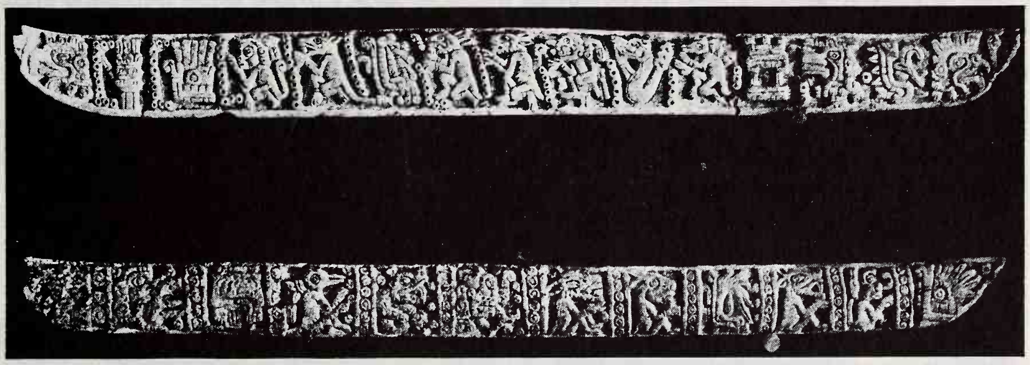
Pectoral representing a Tiger Knight, showing the years 10 Wind and 11 House, and the day 2 Flint (cf. pp. 268).

We can say, therefore, that in hieroglyphic writing and in artistic style there exists a great difference between the material which has hitherto been called Zapotec and that designated as Mixtec. On the other hand this latter material is only distinguished from the Mexican or Aztec by the use of the year sign A.O., by the *occasional* utilization of the numerical system of dots and bars, and by less important stylistic variations.

Bone, showing Year Signs. Reading from right to left, the years 2 Flint, 3 House, 4 Rabbit, 5 Reed in rotation up to 13 (destroyed) Reed. Note the use of the dot system of enumeration and the day sign applied to that of the year.

Heads of Quetzalcoatl. The two heads on either side represent Quetzalcoatl. The one in the middle is Tonatiuh, god of the sun. His head protrudes from the open beak of an eagle which in turn projects from a solar disc. Another eagle hangs from the labret of the god. The head on the right dangles a butterfly in its mouth; that on the left a jade, from which hangs an eagle.





Bones showing Day Signs. The upper bone gives from right to left between the two eagles the first thirteen days of the month, the lower from left to right the first twelve (cf., pp. 268-269).

On this basis, then, I am going to analyse some of the objects found in Tomb 7, which, having hieroglyphs, will permit us to study them. These objects are principally the carved bones and the jewels of gold and silver.

The Year Sign

The year sign, indicated by an intertwined A.O., appears repeatedly on the carved bones and twice on the gold pectoral representing a tiger knight. It is certain that the first 13 years of the indigenous "century," a cycle of 52 years, are represented on the bone (top of page), and the signs united to the year glyph are *Acatl*

(Reed), *Tecpatl* (Flint), *Calli* (House), and *Tochtli* (Rabbit), that is to say, precisely the signs used by the Mexicans and Mixtecs to name their years. The Zapotecs used *Ehecatl* (Wind), *Mazatl* (Deer), *Malinalli* (Herb), *Ollin* (Earthquake), signs which were characteristic also of the Cuicatecs. It should be noted that the numerical system of simple dots, rather than that of combined dots and bars, is used.

Glyphs on the base of a cup of tecali *(alabaster).*

In the pectoral representing a tiger knight (page 266) we have two dates. The sign A.O. tells us that we are dealing here with two years. In the square on the right the glyph inside the A is undoubtedly *Calli*, or "House," and outside we have eleven dots which gives us the reading "Year 11 House."

In the square on the left sign the inside the glyph A.O. is the head of the wind god Ehecatl; and ten dots surround the glyph which gives us the reading "Year 10 Wind." Outside of the glyph also appears another small sign representing a flint knife (*Tecpatl*), and to this are attached two dot

Now, in this case the two years marked on the two squares of the pectoral *cannot* belong to the same calendric system, since the days *Ehecatl* and *Calli* (Wind and House) are immediately next to each other in the sequence of the signs (top page 265) and for two-year signs to belong in the same system they must be five, ten, or fifteen days apart. The actual list of days follows:

1. Cipactli—Crocodile
2. Ehecatl—Wind
3. Calli—House
4. Cuetzpallin—Lizard
5. Coatl—Serpent
6. Miquitzli—Death
7. Mazatl—Deer
8. Tochtli—Rabbit
9. Atl—Water
10. Itzcuintli—Dog
11. Ozomatli—Monkey
12. Malinalli—Herb
13. Acatl—Reed
14. Ocelotl—Tiger
15. Cuauhtli—Eagle
16. Cozcacuauhtli—Buzzard
17. Ollin—Earthquake
18. Tecpatl—Flint
19. Quiahuitl—Rain
20. Xochitl—Flower

Since each year begins with one of the above signs, and since the list is repeated in the same order indefinitely and without interruption, after 360 days each of the twenty signs will have been repeated eighteen times, and to complete the 365 days of the year we shall have to count five more days from our point of departure. Thus the first day of one year must necessarily be five days later than the first day of the year before. For example, if a year begins with the day *Ehecatl*, the three-hundred-and-sixtieth day of that year will be *Cipactli*, and the last five days will be *Ehecatl, Calli, Cuetzpallin, Coatl*, and, finally, *Miquiztli* which will be the last day of the year, causing the next year to begin with the day *Mazatl*. The following year will begin with *Malinalli*, the next with *Ollin*, and the one after that will begin with *Ehecatl* again. In the same way if the year has begun with *Calli*, the following years will begin with *Tochtli, Acatl*, and *Tecpatl*, but never in the same calendric system can one year begin with *Ehecatl* and another with *Calli*, as do the years on the pectoral. On the other hand the *2 Tecpatl* (2 Flint) which appears in the left-hand square is undoubtedly a day sign, since it is not united to any other year sign.

We know that the Zapotecs, like the Mayas, named their years for the signs *Ehecatl, Mazatl, Malinalli,* and *Ollin,* while the Mixtecs and the Mexicans named them for the signs *Calli, Tochtli, Acatl* and *Tecpatl.* Moreover, on the calendar the day 11 *Calli* follows immediately after the day 10 *Ehecatl*, yet both these signs appear on the pectoral.

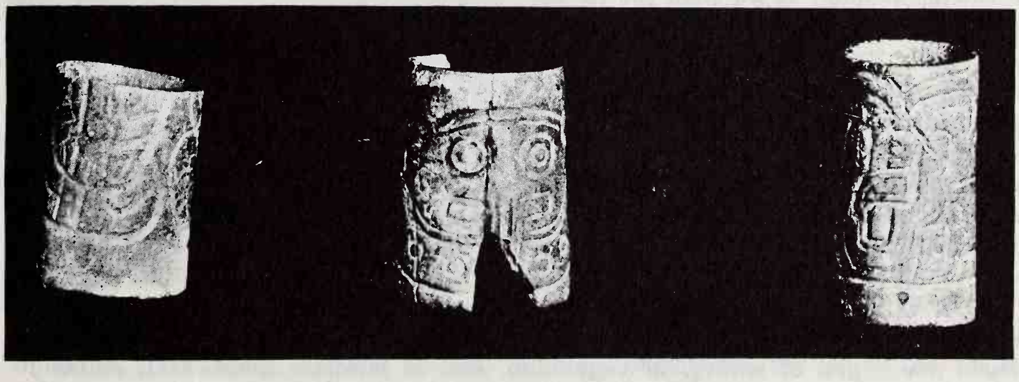
As a probable hypothesis I suggest that we have here an attempt to correlate the two calendars, the Mixtec and the Zapotec, and that both signs stand for one and the same year, called by the Zapotecs 10 *Ehecatl* and by the Mixtecs 11 *Calli*. The complete reading of the pectoral would then be as follows: "The day 2 *Tecpatl* (Flint) of the year 10 *Ehecatl* (Wind) in the Zapotec calendar, which is equal to the year 11 *Calli* (House) in the Mixtec calendar."

The Zapotecs, like the Mayas, computed only elapsed time, so that it is quite probable that they should name the year which began with the day 11 *Calli* by the last day sign of the preceding year, that is to say, 10 *Ehecatl* whereas the Mixtecs and the Mexicans computed time while it was actually elapsing, so that they named the year which began with 11 *Calli* precisely by that day sign. (On page VI of the Vienna Codex we have also the Mixtec year sign joined to an owl head, which is also a Zapotec day sign. Cf. No. 8, bottom of page 265). The occurrence on the pectoral of the year sign A.O., similar in every respect to that which appears on the carved bones, proves the jewel to be Mixtec.

The Day Signs

In addition to the three day signs which we have mentioned, among all the other signs that appear on the bones and on the alabaster cup (page 268), *not one is Zapotec*, and furthermore they are in every respect similar to those which appear in the Mixtec and Mexican codices. Note for example the top bone in the illustration on the bottom of page 267, on which from right to left there is first an eagle head, then the first thirteen days of the calendar, from 1 *Cipactli* to 13 *Acatl*, and finally another eagle head. The other bone in this same illustration, on which appear the day signs, must be read, on the contrary, from left to right. It also begins with *Cipactli*, though this figure is almost destroyed, but instead of having 13 days, it has only 12 and ends with *Malinalli*. The dots which occupy the separating brackets between the day signs on this bone have no numerical value. The third bone illustrated on page 267 is the one already discussed, which has the year glyphs, attached to each of which appears one of the four day signs, *Acatl, Tecpatl, Calli,* and *Tochtli*.

On other bones also there are day signs used either as the names of people or as

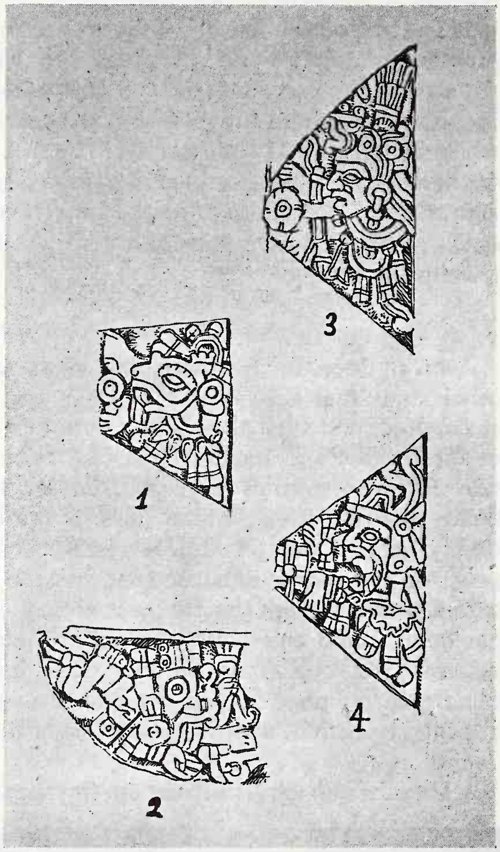


Carved bones showing the Zapotec glyphs.

dates. Thus I have found 4 *Tochtli*, 13 *Cozcacuauhtli*, 8 *Calli*, 8 *Ehecatl*, 7 *Acatl*, 5 *Quiahuitl*, 7 *Ollin*, 4 *Xochitl*, 8 *Ocelotl*. There is not a single day sign which fails to appear somewhere, and there are moreover very important variants which I shall treat in detail in my monograph. Of all the bones and objects with hieroglyphs, *not one* bears a Zapotec sign, and it cannot be said that this is because the Zapotecs made no use of carved bone, since precisely at Monte Alban, from a place on the main highway, one of our guards recovered the three bones figured at the foot of this page, the designs of which are more clearly shown on this page and the next.

The upper one represents an owl and another hieroglyph that I have not been able to decipher, although it seems to be a place name. The one at the left shows two claws of a bird of prey, perhaps an eagle, and facing them another hieroglyph which I would interpret as a bundle or a knot. The one at the right represents a conventional serpent with a great forked tongue and a graticulated body. The rattles of the serpent are carved in the space facing the head.

The three glyphs are of a style completely Zapotec. Note for example the glyphs M and F among the day signs of the Zapotec calendar shown on page 265, representing the serpent and owl heads, taken from Zapotec inscriptions. A mere superficial inspection is enough to convince one that these three carved bones are totally different from those found in Tomb 7.

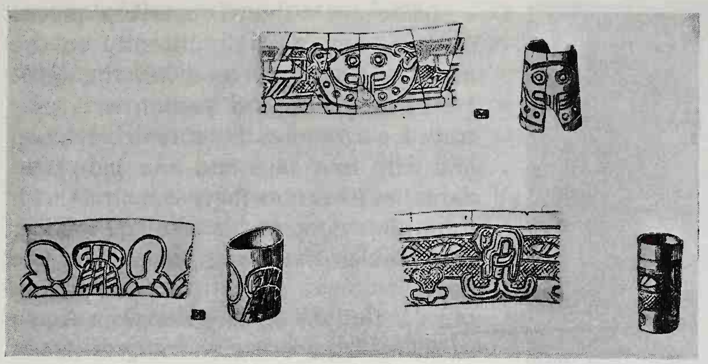


Figures of gods on the carved bones: 1. Xolotl, god of monsters. 2. Tlaloc, rain god. 3. Tonatiuh, sun god. 4. Quetzalcoatl, god of life, the wind, and the planet Venus.

The Gods

Representations of gods are also to be found among the objects of gold and the carved bones. In the former the two heads of *Quetzalcoatl* (page 267) are of particular interest. Each head projects from a solar disc, conceived in the Nahua or Mixtec manner, as we shall see hereafter, and wears over his mouth a sort of bird beak. But what definitely distinguishes these heads as those of *Quetzalcoatl* are the twisted ear plugs which in Mexican (Nahua) are called *epcololli* and which are always worn by the wind god and other associated deities, for example *Xolotl*. In the tomb we found several of these ear plugs lifesize, three of gold and the rest of shell. Never yet have I discovered a representation of *Quetzalcoatl* thus conceived, in a Zapotec urn or sculpture.

But without doubt the most beautiful image of any deity among all those we found in Tomb 7 is the already famous little mask of the god *Xipe-totec*, "our lord the flayed one," god of spring, of vegetation, and of jewelers (page 271). Although Sahagún tells us that he was a Zapotec god, under his other name Yopi, he seems also



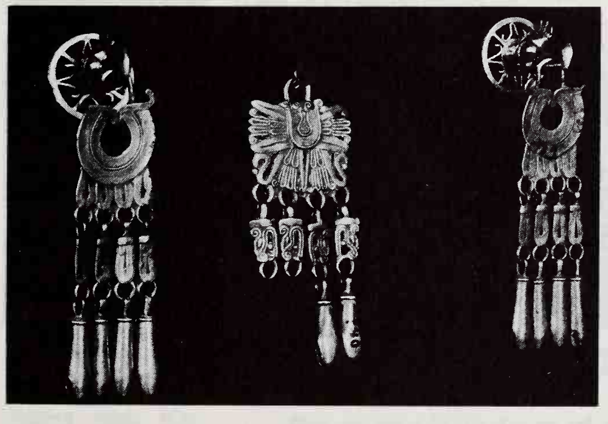
Drawing of Zapotec glyphs on bones shown on page 269.

to distinguish him as god of the *Yopi* or *Tlapaneca* tribe, who lived enslaved by Mixtec tribes in the region conterminous to the present states of Guerrero and Oaxaca. (See page 427 in Seler's translation.)

As a matter of fact I never remember seeing any Zapotec funerary urn or stela in which *Xipe* appears with the attributes we are used to seeing in his attire, whereas in Mixtec codices his appearance coincides with that of the little mask. The nose-plug with a cone in the middle and two lateral bands shaped like a swallow tail is found constantly in the representations of this deity.

Little mask of the god Xipe-totec.

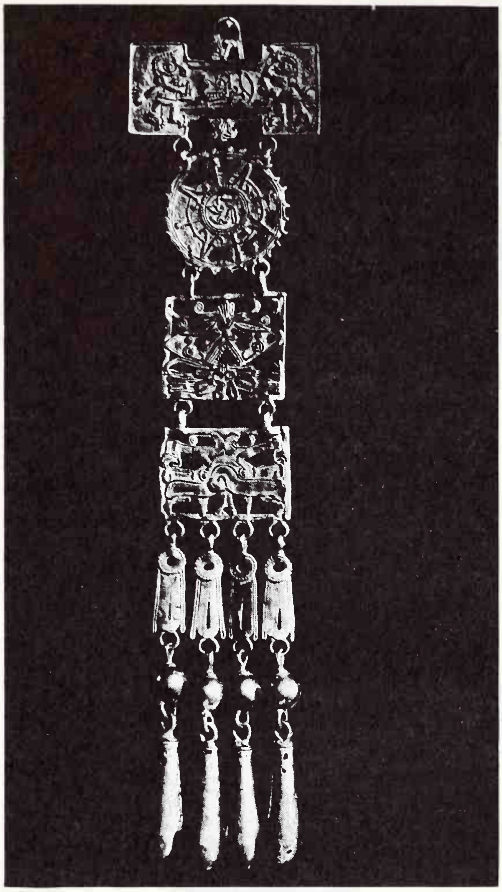
On the bones we found portraits of *Tlaloc, Tonatiuh, Xochipilli, Xolotl, Huehuecoyotl, Quetzalcoatl*, identical with these gods as they are represented in Mexican and Mixtec manuscripts, but we have had no such experience with the Zapotec urns and sculptures (see page 261). We could add the same of the animals, especially those which are day signs in the *Tonalamatl*, but for comparison one need only see those on the bones here published and to which I referred above.



Moon symbols. On the right and left are eagle heads projecting from solar discs and bearing in their beaks symbols of the moon. In the middle is another representation of the moon.

The Symbols

The symbols most common on the jewels of Monte Alban are the sun, the moon, the sky, the butterfly, as symbolic of fire, the *chalchihuite* (jade), the *tlachtli* (ball game), the earth monster, the falling eagle, the mountains, the representation of conquests, etc.

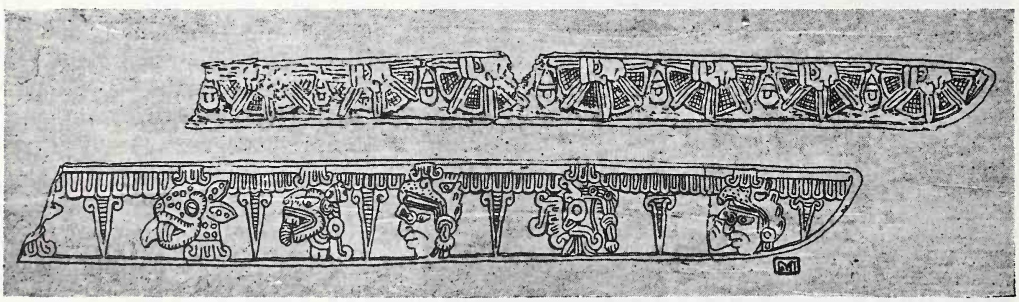


Gold pectoral of many sections. Above, the tlachtli *or ball game, representing the sky and the movement of the stars. Next the sun. Next a flint knife representing the moon. Last the toad, symbol of earth.*

The sun is shown on several pieces of gold, but most significantly on the many-sectioned pectoral (at the left). Here, in the second section it is portrayed surrounded by a river of blood and with four rays and four jade pendants; at its center there is a circle with forty-nine dots and a skull. Probably the jeweler meant to make fifty-two dots, such as sometimes appear in representations of the solar disc. Again in a small gold disc and others like it from which project eagle heads, *Quetzalcoatl* heads, etc., the sun appears shown after the Mexican or Mixtec fashion.

The moon appears three times in these pendants: twice in the beaks of the eagles and a third time on a bangle. In all three it is shown as the Mixtec codices (page 271). The celestial band in the Mixtec or Mexican style with the symbol of Venus alternating with flint knives or stellar eyes, also appears many times on the bones illustrated at the bottom of this page and once on a large shell bracelet shown on page 273.

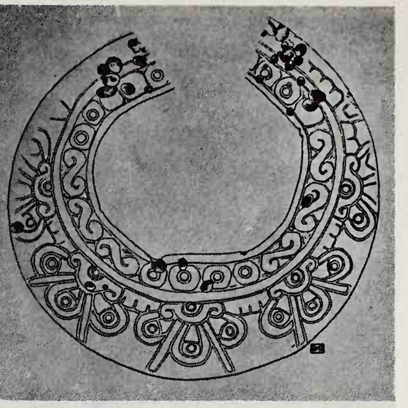
The butterfly as a symbol of fire, and also the jade, are found as pendants in the beaks of the eagles that decorate little plaques and rings of gold and silver (page 274). The *tlachtli* or ball game appears once on the first



The Celestial Band, as shown on the carved bones. The upper carving repeats the design of the sun god set in the celestial band. The lower shows the band extended with faces of divinities between the rays.

section of the multiple pectoral (page 272), and again as a place name on one of the bones. The monster of the earth, a toad with his mouth wide open, is also to be found on the last section of the multiple pectoral, and on several bones.

Conquered towns are indicated by the place glyph crossed out by an arrow, as is the rule in Mixtec codices; see for example the glyphs on one of the bones compared with the codices (bottom of page 274). On Zapotec stelae the place glyphs are shown (page 275) by a hill, with the name glyph inside it. The Mexicans use hills, too, but conventionalized after another fashion; and thus we find on one of the Monte Alban bones (right-hand Place Glyph, page 274) a conventionalized hill exactly like those in the Mixtec codices.



The Celestial Band, as shown on a shell bracelet.

Lastly, the "falling eagle" or *Cuauhtemoc* is very common on the rings. This is symbolic of the setting sun as we have seen it in any number of Mixtec and Mexican codices, and as it appears also on a gold ring, published by Saville (*The Goldsmith's Art in Ancient Mexico*. Plate III, c, d).

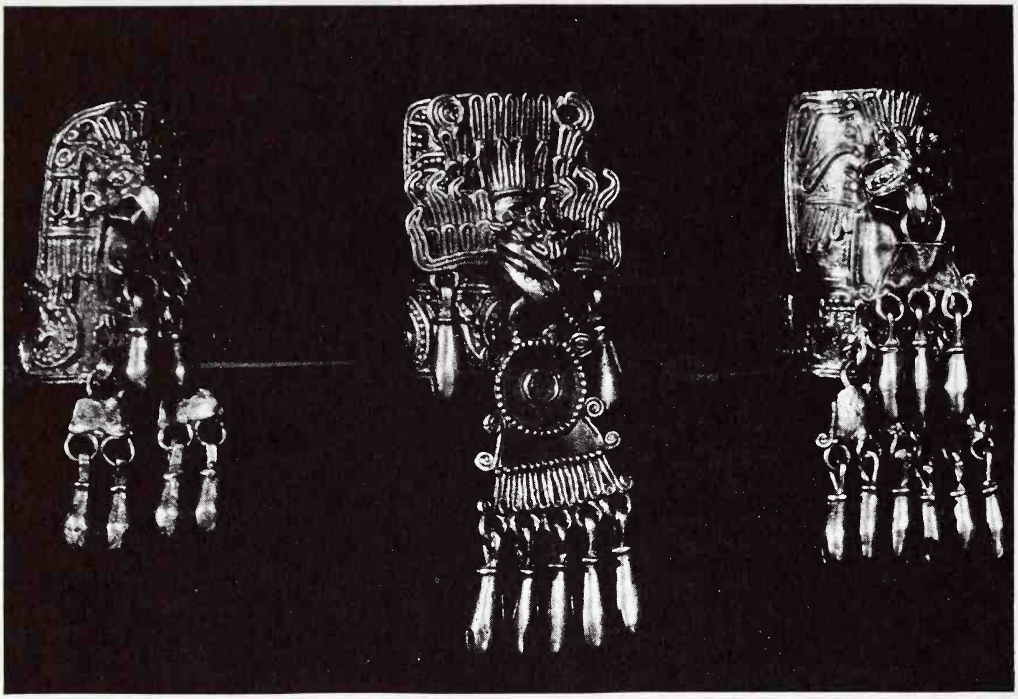
To summarize: The year sign, the day signs, the portrayals of gods, animals, and symbols as shown on the objects from Tomb 7 of Monte Alban are similar to those in the Mexican and Mixtec codices, and *totally different* from those which we find on Zapotec urns and stelae. On the other hand, I have thought I perceived Zapotec style similar to that of the urns and stelae in certain of the gold objects already known; for example, that published by Saville, plate IV, of the above-mentioned volume, and the ring (page 275). In these gold objects I seem to note a certain difference from the others already known. On the other hand, it must not be forgotten that the technique of working gold seems to have been the same all over pre-Colombian Mexico, so that it is probable that objects made of that metal, even when they come from places at great distances from each other, should have a similar appearance.

Falling eagle (Cuauhtemoc). Symbol for the setting sun. In his beak he carries a butterfly.

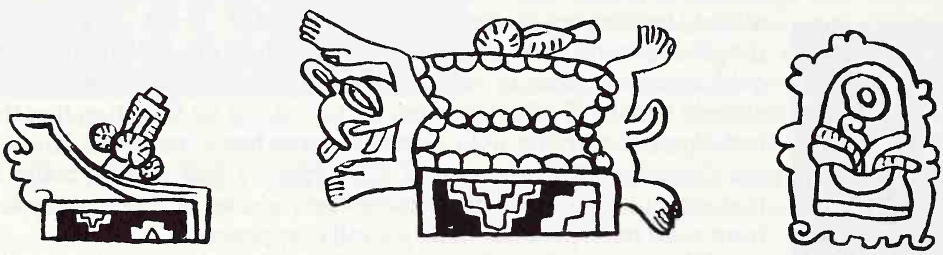
We can say that all the objects found in Tomb 7 show great similarity with Mixtec objects and codices and no stylistic similarity to the style hitherto called Zapotec, that is, that of the urns and stelae. We are forced, then, to accept one of the two following hypotheses:

Either the objects of Tomb 7 are Mixtec, as contrasted with other objects found in Monte Alban and even those placed with the first burial in the tomb, which are Zapotec, or else what we call Zapotec is merely an older style which was replaced later by a new one which we call Mixtec, and as I have already pointed out in my book *The Zapotec Stelae*, this new style may be credited to the influence of tribes of the highlands (Olmecas, Mexicans) in Zapotec art and industry.

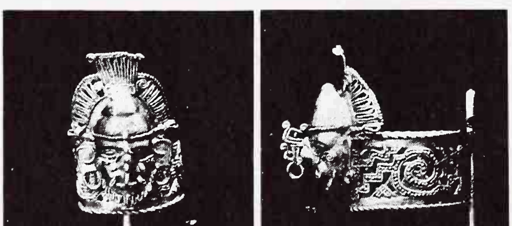
But to decide in favor of one of these alternatives we need more excavation and above all stratigraphical excavation. There seems as yet no pressing reason, however, to abandon the first



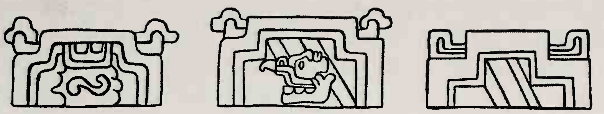
Gold rings. The one in the middle is a falling eagle or Cuauhtemoc. *He bears in his beak the glyph meaning jade.*



Place glyphs, as shown on the carved bones from Tomb 7. The first and second glyphs indicate conquered towns, since each sign is transfixed by an arrow. The third glyph is a conventionalized hill. This place glyph is in the Mixtec style, but a similar formula is often used to denote towns in Mexican writing (cf., p. 273).



Zapotec (?) gold ring, showing the head of the god Cocijo.

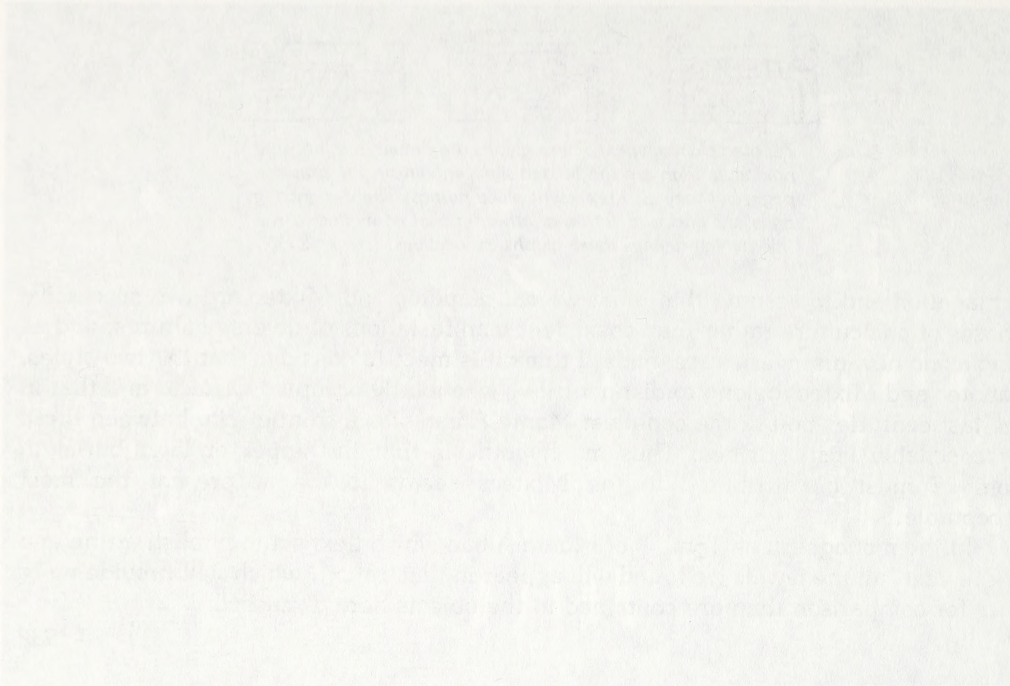


Zapotec place glyphs. These glyphs are drawn in a far more rigid style than are the Mixtec signs shown on the previous page, but they also represent place names. The designating signs are enclosed within another type of conventionalized hill, which defines these glyphs as locatives. (cf., p. 273).

explanation and to assume that what we call Zapotec and Mixtec are two successive phases of one culture rather than coexistent manifestations of diverse cultures; and as long as no new discoveries are made, I think it is meet to consider that the two styles, Zapotec and Mixtec, belong to distinct tribes who jointly occupied Oaxaca, and that in the last centuries before the conquest Monte Alban was a frontier city between these irreconcilably hostile tribes. Thus my hypothesis that the upper or later burial in Tomb 7 must be attributed to the Mixtecs seems to me at present the most acceptable.

In the monograph on Tomb 7 of Monte Alban which I expect to publish at the end of the year, all the jewels we found will appear in illustration, which will provide more data for comparison than are contained in the objects here discussed.

—1932



22

Fundamental Changes in the Interpretations of the Mixtec Codices

by Nancy P. Troike

Since mid-1974 very significant progress has been made in understanding and interpreting the Mixtec codices. These documents consist of pre- and post-Hispanic pictorial texts in which the Mixtecs of the Oaxacan area of Mexico recorded their genealogies, histories, and mythologies. Almost every aspect of Mixtec life, language, and culture represented in these manuscripts is now under intense investigation, but little of this information has yet reached print because of the recency of the work. Other Mesoamericanists may still be unaware that many older concepts about these documents have now been disproved, while whole new areas of study have opened up. This time of almost explosive growth has radically altered the foundations of the field, and as a consequence almost everything that has ever been published about these codices is now partially or wholly erroneous.

The most important Mixtec codex research is currently focused upon correcting the chronology, determining which events are historical and which are mythical, and clarifying the natures and roles of supernatural beings in the pre-Hispanic Mixtec culture. The present paper can only be a summary statement of progress in these and other areas, explaining how the advances have modified or replaced older concepts about the nature and contents of these codices. The data below are grouped under general headings that indicate the major fields of investigation, with the new findings in each area being given in approximately the sequence of discovery.

Erroneous Central Mexican Models

Mixtec codex specialists have now realized that many of the terms and concepts used in the older studies of these manuscripts actually reflect a Central Mexican,

rather than Mixtec, point of view. Earlier scholars apparently absorbed this Central Mexican orientation because of the great amount of literature on that region and the almost total lack of corresponding Mixtec sources. Thus for many years Mixtec codex data have been viewed from this improper perspective and often imperceptibly, if unintentionally, distorted to conform to this alien pattern. This has obscured the real problems, confused the efforts to understand the meanings of the manuscript scenes, and delayed accurate interpretations.

These problems have been particularly notable in the terminology used to describe the pictorial designs and cultural manifestations in the codices. Those terms derived from the life of the Conquest-era Mexica are the *most* inappropriate, for the Mixtec culture is considerably older than that of the Mexica, and any close similarities they may share are probably due to Mexica borrowings from the Mixtec. Various of the works cited below explore the problems that these discredited Central Mexican concepts have created in understanding the Mixtec codices and amply demonstrate that accurate interpretations of these manuscripts can be made only through the use of the Mixtec culture and language.

Chronology

The most vital research going on now in the Mixtec codices involves the very complex and closely interrelated problems of the chronology and the mythical history. Many Mesoamericanists do not yet realize that there *is* a chronology problem in these Mixtec texts, for Alfonso Caso (1949, 1951, 1960, 1964, 1966) published interpretations of these documents proposing a very precise chronological scheme based on the year signs in the codices, beginning in A.D. 692 and extending into the middle of the sixteenth century. However, this chronology has now been found to be almost totally wrong. The Mixtec ruling class, whose origins and activities are chronicled in these manuscripts, actually did not arise in Oaxaca until several centuries later than Caso proposed. His beginning date of A.D. 692 is perhaps 300 years too early, and the error may possibly be even greater than this.

The crucial flaw in Caso's chronological methodology was that of continuing forward in time at each new year sign in the manuscripts. Although this would seem to be a logical approach when studying genealogical data, he failed to check his dates between intermarrying family lines, and in such cross-checks his errors become quite obvious. The realization that Caso's chronology is wrong is not a new or even a recent discovery; serious Mixtec codex students have been aware of it for some years. It has been independently discovered by at least two persons—Emily Rabin in 1968 and myself in 1965—and perhaps by others. The first published comment that the chronology contained questionable links was made by H. B. Nicholson in 1968.

The work of correcting the chronology is being done by Emily Rabin (1974, 1976a) in a series of papers still in progress. The key genealogical manuscript for her research is the Codex Bodley, which begins with the birth of a founding ancestress from a sacred tree and continues with the "War of Heaven" and the founding of the first known dynasty for the important town of Tilantongo. Rabin has pointed out that by the time Caso's chronology has reached several generations into this first Tilantongo dynasty, it results in such biologically bizarre occurrences as a 76-year-old woman who bears three children, and a man who is nearly 200 years old when he marries and fathers two sons. She has suggested that several 52-year cycles need to be cut from the beginning of Caso's sequence just to bring this early part of the history into a proper relationship with the human genealogies, for individuals whom Caso placed in different cycles actually lived in the same cycle.

Rabin will next explore the mysterious end of the first Tilantongo dynasty and the beginning of the next dynasty, a juncture at which Caso has yet another 1-cycle error which, when corrected, will further reduce his over-all time sequence by another 52 years. In her future work Rabin will correct the remaining errors in Caso's chronology, but only when she has reached the end of all these genealogies will she be able to assign exact Christian dates to the entire sequence. Until then, not only can there be no precise dates in Mixtec codex studies, but it is not even possible to be certain in which *century* an event occurs.

There are substantial and obvious implications for Oaxacan archaeology in these changes in the Mixtec chronology, for all archaeological sequences and attributions utilizing Caso's temporal scheme must be reexamined and corrected. Preliminary indications are that this will eliminate the discrepancies that now appear to exist between the archaeological record and the historical texts of the codices. When these two sources are properly correlated, they will function together to clarify the nature of Mixtec life and culture in the Post-Classic period, an era that is still very poorly explored archaeologically.

Mythical History

The problem area most closely connected with the chronology is that of the mythical history. Basically, the question is whether certain early sequences of events shown in the codices should be understood as real happenings that took place in actual time, or as mythical occurrences that never formed a part of the real world. The relationship between this problem and the correction of the chronology is obvious: do these events represent dates and occurrences that must be incorporated into the final chronology, or should these happenings and their dates be interpreted as separate and apart from the real-time of the human lives recorded in the genealogical manuscripts? Or perhaps the situation is more complex: are some of the dates real and others mythical—and if so, is it possible to distinguish between them? These problems center principally around the interpretation of the Codex Vindobonensis Obverse, with some additional information being found in the Bodley and the so-called "Obverse" of the Codex Zouche-Nuttall. There are two diametrically opposed points of view as to how these data should be analyzed.

On the one hand, Maarten Jansen (1976a) prefers to begin with the hypothesis that the dates in the Vindobonensis Obverse represent actual dates in real time and to attempt to construct a chronology for them. However, he does not expect to be able to accomplish this for all the dates in the text because he interprets the codex itself as reflecting a concept of history more than an actual history.

On the other hand, Jill Furst (1978) has suggested that none of the dates in the Vindobonensis Obverse can be interpreted literally. Going further, she has proposed that when any date that occurs in the Vindobonensis Obverse is also found in a genealogical or historical manuscript, it cannot be construed literally in the latter environment until a very careful examination of all relevant circumstances has been made. If the date fits into the real-time chronology of the codex, it may be acceptable as an actual date; but if it does not appear to fit the chronology, it may be a mythical date and possibly should be removed from the sequence. This latter procedure, if used, would doubtlessly contribute to shortening still further the total time span recorded in the historical and genealogical codices.

The difficulty lies in distinguishing between those instances in which it is necessary to adjust the final chronology in order to incorporate a date and those cases in which a date may be omitted from the chronology without doing violence to real-time

history. However, this problem may arise only infrequently; the Vindobonensis Obverse contains about 200 paired year and day dates, and it is only these specific pairs that are of concern. In the Mixtec calendar system there are 52 different year dates and 260 different day dates, resulting in a total universe of 13,520 different pairs of day and year dates. Only about 15 percent of this total are found in the Vindobonensis Obverse and might, therefore, in Furst's hypothesis, be called into question in other manuscripts. For the remaining 85 percent of the dates, no doubts would arise concerning historical validity.

An association between beginnings and the Year 1 Reed, Day 1 Alligator, has been noted by a number of Mixtec codex scholars. This date pair is composed of the first year of the year count and the first day of the day count, and hence would seem appropriate for beginnings. Furst (1978) interprets this and the other paired dates in the Vindobonensis Obverse as reflecting a sacred calendar system in which certain dates were linked with specific supernaturals and had special connotations. She associates the date Year 1 Reed, Day 1 Alligator, with the supernatural ♀ 9 Grass, whom she interprets as having maize/fertility/earth/lineage characteristics.

Furst's (1977a:208) interpretation of the Vindobonensis Obverse finds a reciprocal relationship among time, space, and supernatural beings in the manuscript. She sees such a pattern of association between supernaturals and dates, as just mentioned, and also between supernaturals and particular localities, and between such geographical locations and dates. The unifying concept for these discrete cultural elements may perhaps be reflected in the Mixtec term *ñuhu*, a word which will be discussed later (see *Linguistics and Archaeology* section).

Furst (1977b) considers most of the events in the Vindobonensis Observe to be mythical, and has interpreted its pictorial text in the following manner. The codex opens in the heavens before time and space have come into being and describes the activities of aged and creator supernaturals. Eventually a couple generates a large flint knife from which is born the great Mixtec culture hero ♂ 9 Wind, whose personal name Furst reads as "Mountain Lion/Serpent" (it is definitely not a "feathered serpent"). The heroic ♂ 9 Wind lifts the water and the sky from the earth, revealing the Mixtec landscape, which is still in a generalized form. A large number of people are born from a sacred tree, and eventually ♂ 9 Wind begins to organize the Mixtec geography. The supernaturals and certain foods are given special attention. The sun appears, and in various ceremonies the features of the landscape are integrated into units, assigned to specific supernaturals, and given their own particular mythological dates. The codex terminates with the world having been set in order; the Mixtec stage is now ready for the activities of the humans whose genealogies and histories are recorded in the other Mixtec codices.

Two codices in addition to the Vindobonensis Obverse show events that form a part of either this mythology or early Mixtec history. Both the Zouche-Nuttall "Obverse" and the Bodley depict a series of battles which Caso named the "War of Heaven" or the "War That Comes from Heaven." Rabin (1976b) studied this conflict and found that it appears to have involved four different groups. One of these factions consists of "stone men," so named because their bodies are shown with the multicolored stripes that indicate "stone" in the Mixtec system of pictorial conventions. Mary Elizabeth Smith (1973:69-71) had earlier proposed that these "stone men" might represent the "original" Mixtecs, who were born from the earth and were later conquered by the people born from the sacred trees. These latter form the Mixtec ruling class whose activities are the topic of all the genealogical and historical codices, and who also triumph in the "War of Heaven." Jansen (1976a), however, has sug-

gested that these "stone man" might be Chochos. He has proposed that a Zouche-Nuttall "Obverse" (1902:2, 3) place sign displaying a rain "deity" mask be identified as Yucuñudahui, and has suggested that a Chocho attack on the Mixtecs at this site precipitated a war that the Mixtecs won. He sees such a postulated victory over the Chochos as creating the basis for Mixtec power.

Whether these various types of events were actual historical occurrences taking place in real time, or were merely the formalized corporate mythology of Mixtec origins, or quite possibly were partially historical and partly mythological remains a crucial question in the interpretation of the codices. It is of particular importance in the establishment of an accurate chronology, but it also affects, directly or indirectly, the understanding of many other aspects of Mixtec life and culture pictured in these manuscripts.

Human History

Despite the widespread ramifications of the chronology and mythical history problems, it is quite possible to find straightforward human histories in the Mixtec codices, and in fact these constitute the great bulk of the data in the texts. These histories are of two basic types: geneaologies that trace biological lines of descent and scenes depicting the political activities of a few exceptionally important persons. The genealogical data predominate and extend over a period of several centuries, from early mythical or quasi-mythical family origins to about the middle of the sixteenth century. Most of the historical incidents shown in the lives of individuals occur during the era spanned by ♂ 5 Alligator and his famous son ♂ 8 Deer.

I made a detailed study (1974a, 1976c) of the entire Codex Colombino-Becker and found that it records the rise to power of ♂ 8 Deer and his eventual murder after he has achieved success and is attempting to create an "empire." The manuscript depicts his political advances, first as ruler of Tututepec, then as he became coruler of Tilantongo with his older half-brother ♂ 12 Movement, after having won the right to have his nose pierced. A dangerous trip to visit an important solar supernatural is made, probably in order to receive an oracular prediction of the future. ♂ 12 Movement's death under mysterious circumstances may have been instigated by ♂ 8 Deer, who used it as the pretext to sacrifice the only two kinsmen who might threaten his claim to rule Tilantongo. The codex completely omits ♂ 8 Deer's five marriages and numerous children, but shows how ♂ 4 Wind plotted successfully to kill him, causing his nascent "empire" to collapse. ♂ 4 Wind's own conflicts were eventually resolved by his nose being pierced, thereby increasing his status and restoring the region to peace.

John Pohl (1977a) studied the political context of the human sacrifices shown in the Mixtec codices and discovered that the majority of the depicted deaths occurred in association with the political affairs of ♂ 8 Deer and his contemporaries ♀ 6 Monkey and ♂ 4 Wind. He concluded that human sacrifices were politically motivated and represented the climax of a power struggle; the sacrifice ceremonies themselves may have served as public demonstrations of changes in power.

Very real political history is also reflected in the work by Carlos Aróstegui (1977) on the marriages shown in the genealogical codices. The Mixteca was divided into a number of small political units that were not always economically viable. Thus of necessity there was a high degree of economic and political interaction, and this could be facilitated by the proper marriage alliances. Typically, conflicts about rulership and succession were resolved by uniting the disputing family lines through a marriage, a child becoming an heir who was acceptable to both families because he was

descended through both lines. Marriage alliances thus contributed to the political stability of the whole Mixteca and to the economic survival of the tiny units.

Two studies I made, in an ongoing series concerning rulership, illustrate how the chronology problem affects and is affected by research on human histories. I analyzed (1976a) the genealogies of all the dynasties of Tilantongo rulers pictured in the Codex Bodley and found the artist of this manuscript to be using several different patterns to show the births of children. I concluded that the nature and distribution of these patterns indicates that some 40 percent of the first sons in these dynastic lines—the sons who would normally be considered to have succeeded their fathers as rulers—actually may never have ruled Tilantongo at all. They probably predeceased their fathers, and the rulership passed from the father to his grandson. If time does not have to be allowed for the life spans of these sons, the result will be a shortening of the chronology for human history in the Mixteca.

I also investigated (1977a) several ceremonies carried out by ♂ 5 Alligator that are apparently of great importance, for they are shown in the Bodley, Vindobonensis Reverse, and Zouche-Nuttal "Obverse." In Caso's interpretation these rites represent ♂ 5 Alligator founding the second dynasty of Tilantongo following the strange death of the last male heir of the first dynasty. However, his hypothesis is in error because the corrected chronology shows that ♂ 5 Alligator is actually a contemporary of the early rulers of the first dynasty and has been dead for many years by the time that dynasty ends. My research indicates that these ceremonies by ♂ 5 Alligator are connected with astronomical cycles, particularly for the planet Venus.

The foregoing works demonstrate the variety of human histories now being studied in the Mixtec codices. The interpretations of these histories change and are changed by the problems of the mythical history and particularly by the chronology. Clearly, the completion of Rabin's chronological studies will make the lives of particular individuals much easier to trace, to understand, and to relate to one another.

"Deities"

The problem of distinguishing between real and mythical history influences the interpretations of the nature of all the individuals pictured in the Mixtec codices. If these manuscripts are recording the real history of real people, then the activities of these persons must remain within the bounds of human abilities, as Rabin has pointed out. But if some of these are not human, then human limitations should neither be expected nor applied. Therefore the nature of the Mixtec supernaturals is also connected with the questions of chronology and history.

Nicholson (1978) traced the appearances of ♂ 9 Wind in several Mixtec codices, particularly the Vindobonensis Obverse. He calls attention to the role played by this culture hero in some of the manuscripts of the Coixtlahuaca Group, where his participation in early activities seems to be a simplified version of the fuller account of his role in the creation of the Mixtec world that is pictured in the Vindobonensis Obverse.

At the 1976 meeting in Paris of the International Congress of Americanists, a session was devoted to the discussion of problems in the study of the Mixtec codices (Troike 1976d). The nature of the Mixtec supernaturals was a major topic of consideration, for codex specialists had become increasingly dissatisfied with the term "deity," a word used for many years to describe all apparently nonhuman personages depicted in these manuscripts. The discussion rapidly determined that the Mixtec word *ñuhu* probably held the key to understanding the Mixtecs' own concept of supernaturalism. The term is not yet clearly understood, but it appears to encompass several types of supernatural beings, including those that might be considered

"gods," spirits and dead ancestors, and in certain cases even living humans; each type may have had different roles, powers, abilities, and responsibilities. The concept of *ñuhu* was compared to that of *mana* and to the capabilities of the ancient Greek heroes, who sometimes had supernatural or superhuman powers. However, it was the consensus of the participants in the discussion that because *ñuhu* could not yet be satisfactorily defined, the term should not be used until further research had clarified its meanings. The terms "deity" and "god" should probably be eliminated, pending the determination of the appropriate categories for Mixtec supernaturals and the definition of suitable terms for each type.

Pohl (1977b) has noted that Mixtec supernaturals were probably considered more as "forces" that affected humans than as "deities." The drawings of these personages in the codices are thus not necessarily intended to represent beings who might actually have existed at some time in the real world.

Furst (1977b) has suggested that some of the supernaturals shown in the Vindobonensis Obverse represent the personification of important features in the Mixtec culture such as maize, pulque, the hallucinogenic mushroom, and the sacred birth tree. She has explored (1977a) the personification of this latter tree, concluding that it represents ♀ 9 Reed, an important supernatural. She was able to identify (1977c) ♀ 11 Serpent as the personification of the maguey plant, pointing out that the manner in which this supernatural is usually depicted in the Mixtec codices—decapitated and with her heart cut out—is merely a graphic representation of the fate of the maguey plant when its juice is extracted to make intoxicating beverages.

The present trend in Mixtec codex research seems to be against the hypothesis that the supernaturals pictured in the manuscripts were "'deity' impersonators": humans clad in the attributes, and carrying out the activities, of the "god." The idea itself may be another case in which a Central Mexican concept has been imposed upon the Mixtec cultural pattern. Instead, the research seems to point toward a concept of duality for supernaturals in which one physical form is a plant or animal manifestation and the other a human personification. Supernaturals having dual forms must have been able to change between them just as the two sons of the creator pair were able to move between their human and animal shapes (García 1729:328). If so, then the personified depictions of supernaturals in the codices were intended only to represent the human manifestation and not to portray an actual individual.

Calendar Names

Prior scholars have simply assumed that the birth dates forming the calendar names of the individuals shown in the Mixtec codices also reflected the same Good and Evil auguries given for those days in Central Mexican sources. Rabin (1975) investigated this assumption and found it to be totally mistaken, merely another example of the erroneous imposition of Central Mexican concepts upon the Mixtec data. She noted that in Central Mexico the name for a newborn child could be derived from such sources as an ancestor, the presiding god of the *trecena* of birth, or the calendar day of birth. If the augury for the actual birth day was not pleasing, a different date could be selected, but only from among those days still remaining within the birth *trecena* following the actual birth date.

Rabin then analyzed the pre- and post-Hispanic Mixtec screenfolds for comparative date, omitting only the Vindobonensis Observe; by this means she intended to include all possible humans while excluding those personages who might be supernaturals, since there might be a difference in naming practices between the two groups. From these manuscripts she obtained a universe of 1,001 different

individuals. If the Central Mexican pattern were operative, most of these Mixtec calendar names could be expected to have either Good or Indifferent auguries because of the allowable change if the actual day was unsatisfactory. She found that almost half of the Mixtec names would indeed have Good auguries in the Central Mexican system, but nearly 40 percent would have Evil auguries. Among those whose calendar names would be Evil are several of the most important Mixtec supernaturals, including the great culture hero ♂ 9 Wind, whose name date Bernardino de Sahagún (1957:7) stated to be "wholly and entirely evil."

The analysis indicates that the Central Mexican augury pattern is irrelevant to the Mixtec use of calendar names and that any attempt to apply this foreign system to the Mixtec data will merely result in erroneous conclusions. The Mixtec either used a completely different set of Good and Evil days, or more probably had no augurial system at all in connection with calendar birth date names.

Linguistics and Archaeology

An understanding of the Mixtec language is essential to the interpretation of the linguistic elements in these codices. The need for linguistic analyses was one of the points stressed in the discussion session at the International Congress of Americanists (Troike 1976d), with the 1961 article by Robert Longacre and René Millon being mentioned as an example of insights that could come only from linguistic work. In that paper, the forms of some 80 words of Proto-Mixtecan and Proto-Amuzco-Mixtecan were reconstructed and analyzed for cultural information. Among other discoveries, the authors found that the reconstructed words for "day" and "name" possibly had a relationship on the Proto-Mixtecan level, suggesting the very early existence at *ca.* 1000 B.C. of a calendar system from which persons took their names. If so, calendar names could have been in use among the ancestors of the Mixtecs for many centuries before the Central Mexican augury system was created. Information of this nature, recoverable only through linguistic analyses, obviously can contribute greatly to an understanding of the evolution of Mixtec culture.

Kathryn Josserand and Henry Bradley have been engaged since early 1977 in a field survey of 500 Mixtec villages, working to define the modern Mixtec dialect areas. Analysis of their data, when complete, will yield detailed information on these dialects and on other aspects of the language, such as phonology, syntax, and glottochronology. Nicholas Hopkins and Josserand (1978) have edited a book containing papers on Otomanguean topics, and a large Otomanguean bibliography that is quite complete for Mixtec. The great amount of work still being done by the linguists of the Summer Institute of Linguistics provides material for detailed comparative studies.

Linguistic research on Classic Mixtec (the language as spoken at the time of the Spanish arrival) and its Colonial developments is being conducted through the study of archival documents written in Mixtec. María de los Angeles Romero and Ronald Spores (1976) have surveyed manuscripts in the Archivo del Juzgado in Teposcolula, finding a number of texts written in Mixtec from the latter half of the sixteenth century until well into the nineteenth century. Josserand, Jansen, and Romero (1978) have discovered additional documents elsewhere and are proceeding with a linguistic analysis of all the available texts to uncover Mixtec dialect differences in the Colonial period. The dialects in some cases contain elements making mutual communication difficult, reflecting different spheres of contact and diffusion that may correlate with political and economic entities in the pre-Conquest era.

Connections between linguistic and archaeological data are also being sought. Bruce Byland (1978) noted that information from codices and sixteenth century written

documents indicated the Coixtlahuaca region was occupied by speakers of Chocho who were sometimes at war with the neighboring Mixtecs. An archaeological site survey of the Tamazulapan Valley showed that known Chocho and Mixtec areas were characterized by distinctions in a key pottery type, and led to the discovery of a distributional frontier between the two groups, enabling the archaeological data to be used for establishing the political boundary. Determining the pre-Conquest locations of these two peoples will be of considerable help in ascertaining the origin of the manuscripts of the Coixtlahuaca Group (discussed below).

The Ñuiñe writing system, found in Mixteca Baja during the Middle Classic period, has been studied by Christopher Moser (1977). It displays no connections with the pictographic writing found in the extant codices, and there is as yet no proof that the language represented in the Ñuiñe glyphs is Mixtec. Moser has proposed, as tentative hypotheses, that the glyphs enclosed within circular cartouches may be the names of persons and places, while those within squarish cartouches are dates.

Although none of this linguistic work has been directed towards the codices per se, all of it is basic to the deciphering of those pictorial elements in the manuscripts that depict sounds in the Mixtec language.

Place Signs

The Mixtec codices contain at least two classes of drawings that represent names in the Mixtec language: those for the personal names of individuals and those giving the place names of geographical locations. Smith (1975) has explained the functioning of the Mixtec pictorial system to express the Mixtec language, noting that the codices may convey information through symbols, pictorial conventions, and signs. Neither symbols nor pictorial conventions are necessarily confined to a particular language. A speech scroll is a symbol used in a number of different Mesoamerican cultures to designate forms of vocalization, while an example of a pictorial convention is a drawing of a man and a woman facing one another to indicate marriage. Signs in the Mixtec codices represent the Mixtec language, however, and are used to state the Mixtec names of places and people. Place signs are more complex and utilize a larger vocabulary than personal names, and some site names reflect regional differences in Mixtec dialects through the use of special signs.

All pre-Hispanic pictorial writing systems must be related to the language they represent before the signs can be interpreted correctly, and for the Mixtec codices, this is the Mixtec language. Unfortunately, since Mixtec and Central Mexican drawings may share certain visual similarities due to the latter cultures having adopted the Mixtec art style, Nahuatl descriptive terms have sometimes been applied to the signs in the Mixtec manuscripts. Such improper and inaccurate terminology merely delays the correct interpretation of these signs, which can be made only through the Mixtec language and culture.

Smith (1974) has been able to identify the place sign called "Mountain That Spits" or "Belching Mountain" in the Codex Selden as Magdalena Jaltepec, a town in the Valley of Nochixtlán. Jaltepec's Mixtec name is Añute, the initial *a*- being a locative prefix characteristic of the Nochixtlán Valley and represented in the Mixtec codices by a human jaw. The text of the Selden is devoted to the genealogical chain of rulership for this site, extending from mythical beginnings until nearly the middle of the sixteenth century, and on this basis Smith suggests that the manuscript itself probably originated in Jaltepec.

Smith (1976) has also studied the place signs and Mixtec glosses in the Codex Muro. This manuscript originated about the middle of the sixteenth century as a

genealogical document, with glosses and additional drawings in different hands being added later. It is apparently from the town of San Pedro Cántaros in the Valley of Nochixtlán, and most of the glosses list the names of nearby boundary sites, although some boundaries are also given for the towns of Amatlán and Adequez.

Jansen has been conducting intensive field work in the Mixteca Alta for several years and has suggested the correlation of a number of place-sign drawings with modern geographical locations. His proposed identification of Yucuñudahui has been mentioned above (see *Mythical History* section). He has identified (1976a, 1976b) a full-page drawing in the Zouche-Nuttall "Obverse" (1902:36) as representing the town of Apoala and localities in the valley near it. For the "Place of Heaven," where the sky rests on the cutting edge of a copper ax, he has suggested (1976a) a correlation with a mountain east of Apoala now called Cahua Candihui. He has also proposed (1976a) that one of the best known scenes in the Mixtec codices—a complex depiction extending across two complete pages in the Zouche-Nuttall "Obverse" (1902:19a-19b) and showing a series of interrelated events at a large green hill—may occur at an important mountain near Apoala named Cahua Laki.

Viola König (personal communication) has carried out fieldwork in the Mixteca Baja and can now identify most of the place names in the Codex Egerton. She discovered that the manuscript is arranged so that the sites on the obverse side are all in the Juxtlahuaca region, while on the reverse face the localities lie between Huajapan and Acatlán. These data will form a part of her dissertation at the Universität Hamburg, in Germany.

With a number of individuals actively working on the geographical aspects of the codices, and linguistic research underway that will resolve some of the language problems that presently impede understanding, it seems probable that many of the place signs will be securely identified during the next few years. For the first time it will then be possible to associate the events in the manuscripts with definite towns and regions of the Mixteca. This should greatly stimulate archaeological work, for not only will it enable some localities in the codices to be correlated with known sites, but it should also suggest the most important areas for surface surveys and excavations.

Personal Names

The personal names of all the individuals in the Mixtec codices are given by means of drawings that represent sounds in the Mixtec language. No formal linguistic analysis of these names has yet been published. Even the visual identification of the elements comprising the names is often difficult, and in addition each component may have a range of pictorial variation that is linguistically significant. As a consequence, personal names are usually stated as descriptive paraphrases that approximate the objects or actions composing the name.

Linda Goff (1976) analyzed the occurrences of the designs that Caso called "jewels." She found that these consisted of a main form and two stylistic subtypes, sometimes characterized by different colors and shapes. This illustrates one of the problems in defining the component parts of a personal name, for if different types of "jewels" should have different names in Mixtec, the personal names they indicate could be quite different, and the use of Caso's omnibus term "jewel" would obscure such distinctions and defeat attempts at correct linguistic translations.

George Taack (1976), using a similar methodology, traced the occurrence of the "cobweb" design in 10 pre- and post-Contact Mixtec manuscripts. He discovered that it occurs only with women, and noted its relationship with other elements of the personal and calendar names.

König (personal communication), in addition to the place signs of the Egerton, will also include in her dissertation a study of the personal names in this codex, the conventions underlying the composition of the names, and the differences between male and female names.

Aróstegui's (personal communication) dissertation at Yale University will be a study of Mixtec personal naming practices as shown in the major Mixtec codices. In it he will give an inventory and analysis of the most common personal name signs, and explain their visual and linguistic structure. He will discuss the sociological aspects of the assigning of names, to test whether a personal name might point to some relationship among persons sharing it, and he also hopes to determine the rules for assigning names. His data presently indicate that the choice of a personal name may be influenced by the calendar name and by the kinship and descent system.

Ethnographic studies among the modern Mixtecs might materially assist in understanding the naming patterns in these manuscripts, but as yet no codex specialist has undertaken a systematic survey of contemporary customs to search for any possible correlations with pre-Hispanic practices.

Postures and Gestures

Some of the postures and gestures displayed by the figures in the Mixtec codices are intended to convey specific information to the reader, and determining these meanings will contribute significantly to interpretations of the pictorial scenes. A pose must first be defined within a particular manuscript, and the definition must apply equally to all its occurrences in that text, for without such consistency the reader would not be able to interpret it accurately. After such analyses have been completed for several codices, the various definitions of the different positions in each manuscript may then be compared to determine if there are similarities in meaning that indicate a consistent Mixtec usage pattern. The meaningful hand gestures appear to be a late development in the Mixtec visual communication system used in the codices; the meanings of gestures apparently did not completely stabilize before the Conquest and hence may not be the same in all manuscripts. I have been able to decipher this Mixtec pictorial code for most of the hand gestures in the Codex Colombino-Becker and for several body postures found in a number of different Mixtec codices.

In the Colombino-Becker I defined (1974b) a pair of reciprocal hand gestures that indicate one person is making a request and the other person is agreeing to carry out that request. Each gesture utilizes a specific range of hand and arm positions and is confined within a carefully delimited area of space. If a hand makes a gesture while also holding an object, the gesture takes precedence, and the object is pictured merely touching the hand rather than being grasped. Other hand and arm positions are used to indicate that a meaningful gesture is *not* being made; the positions utilized for this purpose are dependent upon the total body posture of the figure. The variations used in this codex for hand gestures seems intended to conceal these patterns from untrained observers of the text.

I determined (1975b) the meanings of two postures that occur in several Mixtec codices to express the attitude or intent of the figures. One position indicates that a person is "dedicated to traveling on a sacred mission." Individuals displaying this pose must fulfill the three criteria of traveling under some type of compulsion for a religious purpose. Another posture indicates "hostility" and is used only by armed figures. It appears most commonly in battle or capture scenes, conditions in which the hostility of the opponents is obvious, but it may also occur in more pacific contexts to express this attitude.

I compared (1976b) these later two Mixtec postures with similar poses found in the Codex Dresden, a pre-Hispanic Maya manuscript, and found that the Mixtec definitions also seem to fit the Maya contexts. Since these two positions also occur in cultures other than the Mixtec and Maya, these meanings may be valid for a much broader area, perhaps even for all of Mesoamerica, and could reflect a widespread use of these postures as pre-Contact pictorial conventions expressing specific information. Such a hypothesis, however, can only be demonstrated by a lengthy series of tests in well-defined contexts in the various Mesoamerican cultures.

The narrative nature of the Mixtec codices provides a wide range of different events against which definitions for postures and gestures may be tested, evaluated, and defined; I have described (1974b) the procedures for accomplishing this. The meanings of these positions can probably be established with greater accuracy through such analyses of the codices than by any other method, and the Mixtec historical manuscripts may therefore hold the key to determining the significance of many of the postures and gestures displayed by human figures in the documents, murals, sculptures, and pottery of other Mesoamerican cultures. To the extent that these other cultures share the positional vocabulary of the Mixtecs, and my preliminary research indicates they do so to at least some extent, then the decipherment of Mixtec poses will also indicate the meanings of these other figures.

Analytic and Distributional Studies

The multitude of human figures in the Mixtec codices usually appear clad in colorful apparel, and it seems reasonable to suspect that the garb and ornaments express useful information. Various features of these drawings have been studied, either singly or in clusters, in attempts to determine the functions and meanings each had for the original Mixtec readers. At present it is impossible to predict whether the major importance of an element lies in its use as an individual item or in its co-occurrence in sets with certain other characteristics. Because of the large number of traits that must be analyzed, this aspect of the research will eventually require computer assistance.

From the flat perspective of the drawings in the codices, the actual configuration of Mixtec clothing is not clear. Patricia Anawalt (1976) investigated this problem, studying the garment commonly called by its Nahuatl name of *xicolli*; the Mixtec name is apparently not known. The Mixtec garment is a fringed, sleeveless jacket tied in front, and the most common color in the codices is red, although other colors also occur. It is worn only by males and in the manuscripts appears in use at all types of events, indicating that it was the proper masculine garment of the ruling class. It may have diffused from Oaxaca to the Mexica, since the Mixtec culture is older than that of the Mexica, but its cultural origin has not been established.

Pohl (1977b) has proposed that the human figures in the Mixtec codices were constructed by the artists in much the same manner as place signs. He sees the human body as a substantive, which could be qualified or modified by costume, body posture, and hand gestures. The costume would express the context of the figure, and the pose and gestures would demonstrate the figure's intentions.

Sally Hyer and Martin Raish have each analyzed the distribution of specific traits in the Zouche-Nuttall "Reverse." Hyer (1976) studied the costumes of the 112 men shown in this codex meeting with ♂ 8 Deer and ♂ 12 Movement at Tilantongo. Using a number of different traits, she uncovered evidence that the artist of the manuscript was merely filling in the details of the clothing from a "standard" costume repertoire. She concluded that if these "standard" elements could be isolated through cluster analyses, the remaining characteristics would represent those factors that actually

aided the native readers in interpreting the pictorial text. Raish (1976) examined all the appearances of ♂ 8 Deer in the codex to search for sets of features that would indicate his status and allow his figure to be identified when his name had not been painted. He discovered that the drawings of ♂ 8 Deer are characterized by definite patterns of apparel and decoration, indicating his superior status over all other persons in the scenes with him.

James Ramsey (1976) studied the styles of portable objects such as pottery, gold jewelry, and jade ornaments in the Mixtec codices and in the manuscripts of the Borgia Group. These latter consist principally of pre-Hispanic ritual texts painted in the Mixtec art style by an unknown people whose ceremonial life was strongly influenced by Central Mexican concepts. He compared these drawings with similar items that had been recovered archaeologically, searching for stylistic patterns that might reflect the areas in which the various codices could have originated. He found that the Mixtec drawings correlated best with the Valley of Oaxaca materials, while the Borgia Group designs showed correspondences with both Puebla and Oaxaca. He cautions, however, that these results might be biased because more data are available from the Oaxaca Valley and Cholula than from elsewhere in this region of Mexico.

Distributional studies represent one of the steps in the massive task of determining which elements of the designs the native readers needed to understand in order to interpret the pictorial texts correctly and fully. Eventually this research will expand into trait clusters of such complexity that computer manipulation of the data will be essential, but at the present time the vast majority of the individual elements in the drawings have not been subjected to even the most basic distributional study.

Structural Analysis

The pictorial text of each Mixtec codex is painted within a particular physical and structural environment that differs from one manuscript to another. These aspects are often overlooked because they do not directly form a part of the scenes to be interpreted, yet a clear understanding of the physical functioning and operation of the original manuscript is essential if a damaged or fragmented document is to be reconstructed, for any proposed reconstruction must maintain the structure and form of the original.

I have explained (1975a) that the first step in restoring a fragmented manuscript is to analyze the extant pieces to determine the original physical structure. I used the Codex Colombino-Becker as the example, for it now exists in seven fragments that must be placed in the correct sequence if the pictorial text is to be interpreted properly. I demonstrated that these seven fragments should be rejoined into three sections, and that four other sections, totaling at least 14 pages, are still lost. Caso's (1966) earlier reconstruction of the codex was incorrect and physically impossible; most of his proposals violate both the physical and the structural integrity of the original manuscript.

Structural analyses are crucial in restoring broken documents to insure that the correct form is maintained. No proposed reconstruction can be accepted unless it is completely compatible with the physical structure of the original.

Codex Zouche-Nuttall

The Zouche-Nuttall was for many years the least studied, and consequently the most poorly understood, of all the major Mixtec historical-genealogical codices. Although it usually figured prominently in any research that traced a single topic through several codices, its own text was rarely the sole focus of interest. Now, how-

ever, it has finally begun to receive its own share of attention, facilitated by two republications of the original 1902 lithographed edition. The version issued in 1974 by La Estampa Mexicana contains Zelia Nuttall's 1902 introduction in English and a translation into Spanish, but no new information is given to correct her mistaken explanation that the manuscript refers to the "Aztecs"; and the physical rearrangement of the codex pages is disastrous. Apparently there was no realization that the entire manuscript was read from right to left, and the pictorial text was organized with page 1 at the front of the book. Thus to read the bands in the correct sequence, the reader must begin at the center gutter of the book and cross the left page to its left edge, then jump to the right edge of the right page and move to the left across it to the center gutter.

In 1975 Dover Publications issued an edition that ingeniously solved the problem of converting the screenfold format into a bound book that retained the correct right-to-left reading of the pictorial text by simply having the reader begin at the end of the book and read towards the front. Nuttall's notes were omitted and an unfortunate new introduction substituted that contains numerous errors of fact and fails to inform the general reader of the nature, purpose, or interpretation of the codex text (reviewed in Troike 1977c).

Ross Parmenter (1976) investigated the background to the publication in 1902 of the first reproduction of this codex. He traced the behind-the-scenes activities of Nuttall in approving the physical materials of the facsimile and in finally seeing it issued by the Peabody Museum. A constant series of problems and crises arose, and in the process of working toward publication, egos were bruised and friendships ruptured. Parmenter uncovered the history of the struggle to create and publish the reproduction in the course of writing the biography of Nuttall.

Some time ago I discovered (1969) paint seepages between the two faces of the Zouche-Nuttall that showed the "Reverse" to have been the side painted first and also found the pages to be identical in size with those of the Colombino-Becker. I continued the comparisons of these two manuscripts by analyzing (1974c) the sequence of the pictorial scenes in the Zouche-Nuttall "Reverse" and in the text of the Colombino-Becker. Both manuscripts relate the life history of ♂ 8 Deer, but there are fundamental differences in the organization of the materials. The narrative of the Colombino-Becker is continuous and flowing, each scene fitting into the sequence and carrying the story forward. In the Zouche-Nuttall "Reverse," however, there are interpolated scenes, duplicated place signs, repeated dates, and nonsequential days; the artist has even painted over some place signs and replaced them with quite different scenes. I postulated that these various types of errors occur because the painter of the Zouche-Nuttall "Reverse" was copying a large *lienzo* which he did not read in the correct sequence, and that this same *lienzo* was later copied more accurately by the artists of the Colombino-Becker.

Although the texts of the Zouche-Nuttall "Obverse" and "Reverse" are not yet as well studied or understood as those of most of the other Mixtec codices, the various works mentioned above have begun to rectify this situation, with the suggested identifications of some place signs indicating the precise geographical areas in which certain events occur. Progress in the interpretation of the nongenealogical parts of the "Obverse" is linked to advances in understanding the mythical and early history of the Mixtecs.

Coixtlahuaca Group

The Coixtlahuaca manuscripts form a distinct category within the general grouping of Mixtec codices. They all originated in the Colonial period, and the great

majority are drawn on large cloths, often with written annotations. These documents were an important topic during the discussion session at the 1976 International Congress of Americanists (Troike 1976d). Although the Coixtlahuaca *lienzos* contain extensive genealogies, none of these many individuals has yet been identified in the Mixtec screenfolds. The Coixtlahuaca region is now inhabited by the Chochos, and it was suggested at Paris that these manuscripts might actually have been the work of Chochos rather than Mixtecs, a hypothesis that has not yet been tested.

Parmenter (1974) has discovered two new and previously unknown *lienzos* of the Coixtlahuaca Group, both from the town of San Miguel Tequixtepec. Tequixtepec I is the larger, measuring approximately 3 m in height by 2.5 m in width. It contains Mixtec-style year and day dates and numerous place signs glossed in Spanish; a long genealogy in the lower part includes 25 generations. Some of these data also appear in the *lienzos* of Ihuitlán and Tlapiltepec, although the Tequixtepec is artistically superior and more detailed than either of these. A fire-making scene in the Tequixtepec is also found in the Tlapiltepec, Selden Roll, and Gómez de Orozco, supporting the inclusion of the Selden Roll in the Coixtlahuaca Group and suggesting a common prototype source for this scene, perhaps of pre-Hispanic origin.

Tequixtepec II is approximately 70 cm wide by somewhat less than 5 m in length. It is genealogical, showing 31 individuals, of whom three are glossed in Nahuatl.

König (1976) analyzed the *Lienzo* Seler II (also called Coixtlahuaca II), another member of the Coixtlahuaca Group. It is a very large sixteenth century *lienzo* some 3.75 m across by 4.25 m in height. In it are depicted 136 persons with calendar names, arranged in male/female pairs representing dynasties, and another 66 individuals, including one Spaniard. Some of these dynastic pairs also appear in the *lienzos* of Ihuitlán and Antonio de León. It contains written names for two Spanish priests who were active in Mexico about the middle of the sixteenth century. Place signs are glossed in several different languages: Mixtec, perhaps Chocho, and a very few in Nahuatl. The place sign drawings that have been identified are for Coixtlahuaca, Tulancingo, and Tequixtepec.

Not all the members of the Coixtlahuaca Group have yet been published, and this lack remains a serious impediment to further research, but despite this, specialists working with these manuscripts have been able to compile lengthy lists of dynasties and genealogies. It is the complete absence of all these individuals from the family lines of the rulers shown in the Mixtec screenfolds that raises the crucial question of whether the Coixtlahuaca texts are actually Mixtec. It is possible that the Mixtec art style was merely being utilized by another people, perhaps the Chocho, to record their own traditions, as also occurred among other cultures in Late Post-Classic Mesoamerica.

Other Manuscripts

The original of the manuscript of Yucunama has been located by Jansen (personal communication) in the village of San Pedro Yucunama. This document had previously been known only through a photostat, but on that basis had been catalogued as No. 421 in the "Census of Native Middle American Pictorial Manuscripts" compiled by John Glass (1975) for the *Handbook of Middle American Indians*. Jansen reports that the manuscript is now framed between two sheets of glass and measures approximately 38 cm in width by 44 cm in height. It contains depictions of five persons, two paired couples and a single male, while along three sides are 35 Mixtec-style year signs for 35 consecutive years. Some 16 glosses in Mixtec give boundary names, the cardinal points, and one statement that Jansen translates as "the Year 1 Reed."

Three rectangles apparently represent fields, beside which are drawn 40 cacao beans whose meaning remains obscure.

Jansen (personal communication) has also located two new pictorials in the towns of Sosola and Yolotepec. Both are drawn in a degenerate style in black ink on European paper and are land documents containing place signs with glosses. The Sosola map is accompanied by a Spanish text of some 80 pages. Jansen and Romero plan a monograph on these two documents and the Yucunama pictorial.

Connections With Other Cultures

Several lines of research now in progress indicate that a close connection exists between some Mixtec and Maya visual forms. This could be the result of borrowing in one or both directions, or the two cultures may share a wider Mesoamerican tradition with other peoples, as was proposed above for some of the postures appearing in Mixtec and Maya codices (see *Postures and Gestures* section). All the current work is still in the exploratory stage, but the historical nature of the Mixtec manuscripts presents the opportunity to study these elements in various contexts and to compare them with the extensive body of knowledge that has accumulated for the Maya.

The codices of the Borgia Group are painted in the same art style as the Mixtec texts and contain some Mixtec similarities as well as obvious characteristics of a Central Mexican affinity. A small amount of work is underway on the Mixtec elements in these manuscripts, which are quite subtle, but unfortunately a substantial body of work on the Borgia Group itself is lacking for comparative purposes; even the culture responsible for the creation of these documents remains a matter of conjecture and contention.

Conclusions

The foregoing data give only a very brief and condensed idea of the progress being made in the interpretation of the Mixtec codices. I have not been able to do justice to the range, variety, and complexity of the work of the individual scholars, nor to cite the supporting evidence upon which their conclusions are based. It should be obvious, however, that the field of Mixtec codex interpretation is now a separate and firmly established area of specialization within Mesoamerican scholarship. The centuries of historical events, wars, alliances, genealogies, and mythologies that these manuscripts depict can no longer be interpreted in fanciful ways by persons having neither a background in nor a knowledge of the Mixtec data. The Mixtec codex field demands of its participants a thorough grounding in the literature and in the culture and language of the Mixtecs.

Because the progress reported in this paper has taken place since mid-1974, most of the data cited here are as yet unpublished. Until these works appear and explain in detail the radical changes that have occurred in the concepts and interpretations of these manuscripts, specialists in other cultures should be advised that almost everything now in print concerning the Mixtec codices is out-of-date and inaccurate.

—1978

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See: Codex Nuttall.

23

Archaeology and Religion: A Comparison of the Zapotec and Maya

by Joyce Marcus

No archaeologist who works for any length of time among the ancient civilizations of Mesoamerica can fail to be impressed by the role that religion played in those complex societies. At the same time, Mesoamerican archaeologists, like prehistorians everywhere, have suffered from the fact that archaeology has absolutely no agreed-upon theoretical or methodological framework for dealing with prehistoric religion. The result is that some archaeologists have chosen to ignore religion while concentrating on subsistence, settlement, and economy. Still others—as pointed out by Ruz (1977)—unrestrained by the rigorous methodologies which have been developed for the study of subsistence and settlement, have allowed their enthusiasm and imagination to turn ancient religion into a personal fantasy.

Prehistoric Religion and Archaeological Methodology

In recent years, a few tentative steps have been taken towards a methodology for the archaeological study of ancient New World religions. Flannery (1976) has suggested that the ritual paraphernalia of Formative Mesoamerica can be submitted to a kind of 'contextual analysis' aimed at distinguishing between items used for ritual on the individual, household, community, and interregional levels; this technique, however, is applicable only to items whose exact provenience is known through excavation. In one paper (Flannery and Marcus 1976a), Flannery and I attempted to document several evolutionary stages in the development of Zapotec Indian religion (including the rise of a 'state religion') through an examination of the evolutionary sequence of public buildings in which the various religious institutions were reflected. In a second paper (Flannery and Marcus 1976b), we argued that a model derived from

the sixteenth-century cosmology of the Zapotec could be used to integrate prehistoric data on subsistence, economics and religion, and to explain various features which would otherwise remain archaeologically enigmatic. In addition, Linares (1977) has used similar data from sixteenth-century Panamanian sources to integrate ideological, ritual, and ecological variables in an analysis of ranked society in Central America.

It should be pointed out that all four of these approaches depend on ethnohistory —in this case, documents written by the Spanish conquerors who were the first Europeans to contact the Indians of Mesoamerica and Panamá, or native Indian manuscripts which were preserved by the Spanish in spite of their efforts to convert the Indians to Christianity. In the New World, ethnohistory is our bridge to the past; without it one could not even glimpse prehistoric cosmology, interpret ancient public buildings, understand the contexts of ritual paraphernalia, or analyze the iconography of long-dead Panamanians.

In this paper I will briefly examine some of the problems and promises of an ethnohistoric approach to religion and archaeology in southern Mesoamerica. I will compare and contrast the Zapotec Indians of Oaxaca, Mexico, and the Maya Indians of southern Mexico and Guatemala (Fig. 1). First, we will see how their ethnohistory, fraught as it sometimes is with European preconceptions and misinterpretations, can nevertheless be used to provide a model for archaeological interpretation. Second, we will see how the archaeological record, enigmatic and incomplete as it sometimes is, can be used to verify or reject aspects of ethnohistory. Finally, I will argue that the feedback between archaeology and ethnohistory, as well as the comparison of the Zapotec and Maya, give us insights we could not derive from using only one subdiscipline, or studying one culture in isolation.

Zapotec Religion: The Ethnohistoric Evidence

Major ethnohistoric sources on the Zapotec include Fray Juan de Córdova (1578a; 1578b), Francisco de Burgoa (1670; 1674), Gonzalo de Balsalobre (1656), and a series of *relaciones* written around 1580 (del Paso y Troncoso 1905-6). While the eyewitness

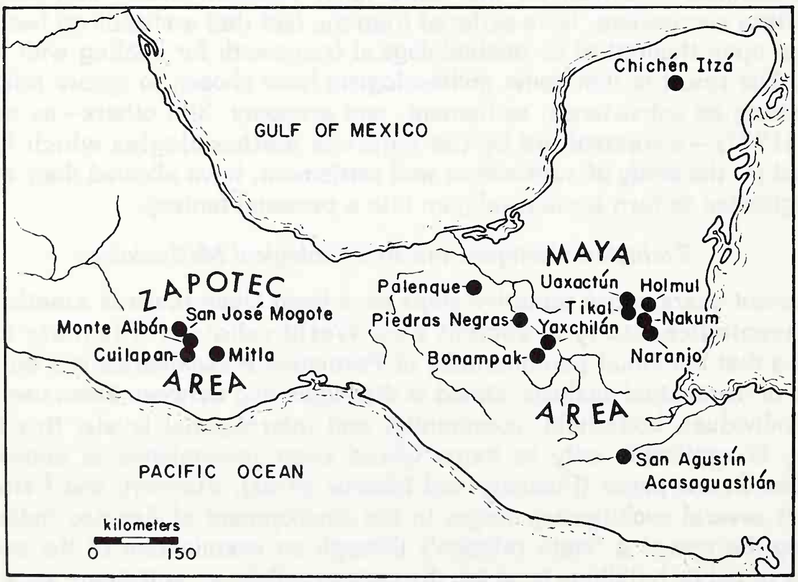

Figure 1. Map of Mesoamerica showing archaeological sites mentioned in the text.

accounts of the early Spanish chroniclers are invaluable, it must be remembered that many were priests whose assignment was to stamp out Zapotec religion, not understand it. Many also had a Classical education, including knowledge of the ancient Greco-Roman pantheon which served as their model for an 'idolatrous' religion. Add to this the fact that they never fully comprehended Zapotec royal ancestor worship, and you have the makings of a serious misunderstanding. In town after town, the Spanish friars wrote down the names of deified, deceased rulers whose images were still propitiated, thinking they had seen the 'idols' of anthropomorphized 'gods' from some kind of 'pantheon.' To this day the misconception has persisted.

In fact, the Zapotec did not have an anthropomorphized pantheon. They did recognize a supreme being who was without beginning or end, 'who created everything but was not himself created,' but he was so infinite and incorporeal that no images were ever made of him and no mortal came in direct contact with him (Flannery and Marcus 1976b). For him, understandably, there is little in the way of archaeological evidence. Man did come into contact with a wide variety of natural and supernatural phenomena, and because the Zapotec attributed life to many things we consider inanimate, anthropologists might characterize their religion as a form of *animatism* (Lowie 1924:133-4).

Perhaps the most crucial concept in Zapotec religion was that of *pè* (written *pèe* in the sixteenth century, pronounced *be* by today's Zapotec). Variously translated as 'wind,' 'breath' or 'spirit,' *pè* was the vital force that made all living things move. Anything that moved was thus alive, to some degree sacred, and deserving of respect: animals, human beings, clouds, lightning, earthquakes, the 260-day ritual calendar and the foam on the top of a cup of stirred hot chocolate are examples of things which possessed *pè*.

Most deserving of respect were the great universal forces: *cocijo* (lightning), *zaa* (clouds), *xoo* (earthquake), *quij* (fire), and so on. Lightning was treated as a revered supernatural who had the power to grant or withhold rain; clouds were regarded as the beings from which the Zapotec (*peni-zaa*, 'cloud people') had descended, and to which their ancestors (*penigolazaa*, 'old people of the clouds') would return after death. The ancestors could intercede with the powerful supernaturals on behalf of their descendants, providing they were well taken care of. All relationships—whether with ancestors, animals, other Zapotecs, or supernaturals—were considered reciprocal, with something offered in return for every concession. The kinds of offerings one could make ranged from food and drink to one's own blood, or a sacrificed quail, turkey, dog, child or human slave depending on the severity of one's need, or the magnitude of one's gratitude. The most important offerings were made by full-time priests at standardized temples.

In my examination of the ethnohistoric sources, I have found a number of elements in Zapotec religion for which archaeological evidence might be sought: (1) the temples which were the architectural manifestation of Zapotec religion; (2) the rituals themselves, including human sacrifice, animal sacrifice, cannibalism, and ritual bloodletting; and (3) ancestor worship. Let us examine these.

Among the sixteenth-century Zapotec the temple was known as *yohopèe* (literally 'the house of *pè*). It was a two-room structure, frequently in an elevated location, and manned by full-time 'priests.' To the outer room came persons who wished to make an offering, but the actual sacrifice would be performed in the more sacred inner room by a priest on an altar called *pecogo*, or *pe-quie* ('stone of *pè*'). No layman ever entered the inner room, and the priests rarely left it.

The Zapotec priesthood had a hierarchy composed of high priests (*uija-tào*), or-

dinary priests (*copa pitào*), and lesser religious functionaries, and young men who were educated to enter the priesthood (*bigaña*, *pigaana*, *pixana*) (see Table 1). Burgoa (1674) says that the *uija-tào* or 'great seer' had as his chief function the consultation with the supernatural on important matters and the transmitting of this information to others. This priest had the power to put himself into an ecstatic state, and believed what he saw in his vision. The *uija-tào* was treated by the Zapotec lord (*coqui*) with great respect and regarded as being closely connected with the supernatural; since he was the direct distributor of heavenly gifts and punishments, the lord turned to him for various needs, and followed his advice diligently (Seler 1904: 248). Priests were recruited from among the children of the nobility, and there are some accounts suggesting that certain religious offices were inherited, or passed to sons or near relatives. There were also *ueza-eche* ('sacrificers') who apparently constituted a specialized group that performed most sacrifices, particularly human sacrifices; after this activity, they brought the heart and blood to the *uija-tào*, so that he could then offer them up.

The *bigaña*, most frequently mentioned in the *relaciones* (perhaps because they had the most contact with laymen), took care of the 'idols' in the temple. Duties of some of the other religious functionaries included the burning of incense, the offering of sacrifices (particularly small animals and birds), and also the offering of one's own blood drawn from the veins under the tongue and behind the ears (Burgoa 1674: chapters 58, 64, 70). For bloodletting, the priests employed a sharp bone or stingray spine, obsidian blade, stone knife or a long fingernail grown especially for this purpose. The blood was caught on grass or bright feathers and then offered to sacred images. Burgoa says that human sacrifice was performed with 'special solemnity and elaborate ceremonies.' Córdova (1578a) adds that there were two or three occasions when human sacrifices were performed. Prisoners of war were sacrificed and the flesh was cooked for eating. Humans were also sacrificed on the occasion of the harvest; and, finally, children (frequently) or adults (occasionally) were sacrificed to *cocijo* (lightning). This offering was seen as paying a debt to *cocijo* for bringing rain.

The role of divination by the *colanij* (fortune-tellers or diviners) was also very important (Córdova 1578b: 216). The *colanij* aided the individual with important decisions to be made—whom to marry, when to marry, the naming of one's children—and took the decision out of the hands of any individual. The actual decision-maker was, in effect, fate or fortune, whose will was determined by casting lots (in this case, counting out beans by 2's, 3's, 4's, or 5's). No one could be blamed or thanked; it was all in the beans.

The Zapotec had great reverence for their ancestors, who were thought to take part in community affairs even after death. If well treated, one's ancestors could intercede on one's behalf with lightning or the other supernaturals with whom they now resided. The ancestors of royalty were even more important than those of common men, and they were often commemorated and sacrificed to as divine beings (Flannery and Marcus 1976b: 381); frequently, temples or commemorative buildings were built above their tombs. It was the sacred images of deceased rulers which the Spanish found in so many temples, and which they mistook for the 'idols' of 'gods.' Clues to this can be found in the names they collected for their 'deities,' which frequently contain garbled versions of *coqui* ('male ruler'), *coquihualao* ('prince'), or *xonaxi* ('female ruler') (Marcus n.d.). A second clue is that many have names taken from the 260-day calendar (*e.g.* '1 Deer,' '8 Rabbit') which we know from Córdova (1578b: 16) and Burgoa (1674: chapter 70: 316) were names given to human beings. The irony is that no 'idols' were ever made of the Zapotec supreme being—the one supernatural who might be considered a 'deity' in our terms.

Even today a kind of veneration of the ancestors continues among the Zapotec. At Juchitán, Oaxaca, and other nearby localities there are important stories about the old people of the clouds (*binigulaza, binnigola, binizaa*). When figurines or other pre-Columbian household objects are recovered, the contemporary Zapotecs say they have found objects that belonged to the ancestors, or say 'we are the descendants of the *binizaa* who provided these' (Henestrosa 1936; Cruz 1936).

Zapotec Religion: The Archaeological Evidence

While 'public buildings' where religious activities may have been performed are known even from Early Formative Oaxaca at 1350 B.C. (Flannery and Marcus 1976a, b), it is not until the Terminal Formative period that we see our first clear examples of the *yohopèe* or Zapotec two-room temple. One of the best preserved early temples was discovered at the site of Monte Albán, the great urban capital of the Zapotec, by Alfonso Caso (1935). The temple, which dates to Period II of Monte Albán (100 B.C.-A.D. 100), was found inside Mound X, to the north-east of the Main Plaza (Fig. 2a). It stood on an elevated platform and had the kind of lower outer room and raised inner room described in the ethnohistorical sources. This structure, built on top of a platform with a stairway on the south side, measured 10 by 8 m. The outer room, whose doorway was flanked by single columns, measured just over 4 m. From the doorway, one crossed 2 m of floor and stepped up into the elevated rear chamber.

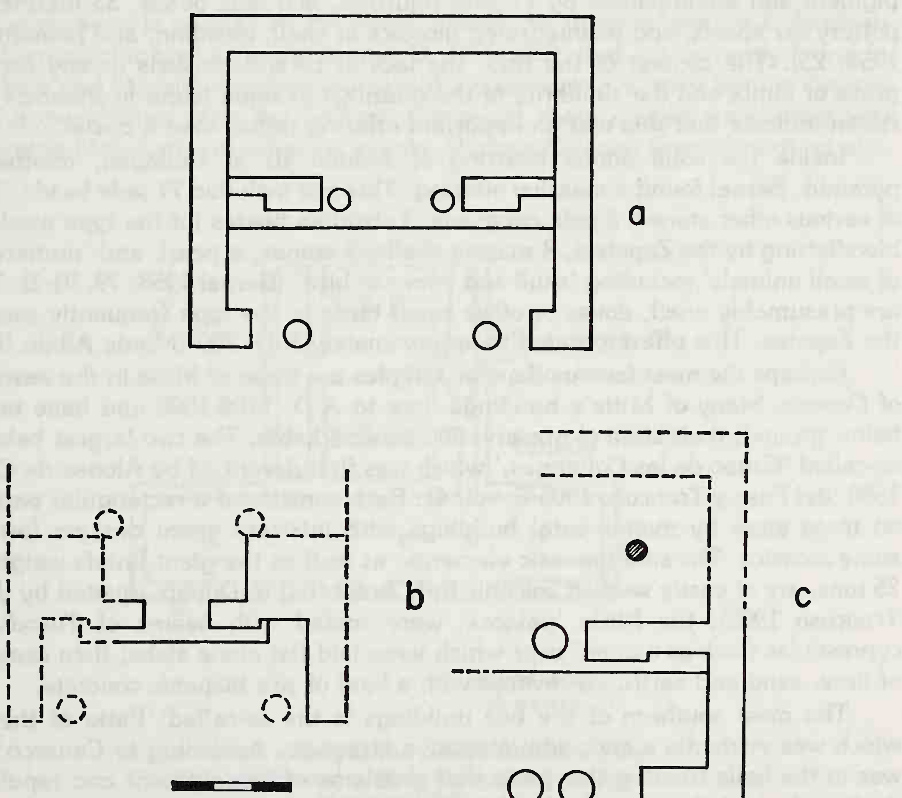

Figure 2. Ground plans of Zapotec temples: (a) temple found in Mound X, Monte Albán (redrawn from Caso 1935); (b) temple found by Saville in Mound I-bis at Cuilapan (redrawn from Bernal 1958); (c) partial plan of Structure 13, San José Mogote (after Flannery and Marcus 1976a).

The latter measured 8 by 3 m and had a 2 m doorway, also flanked by single columns. The walls of the temple were of rectangular adobe over a stone masonry foundation 1 m high. The columns were made of small stones set in clay mortar and vary in diameter between 82 cm (outer chamber) and 57 cm (inner chamber) (Flannery and Marcus 1976a: 217-18).

In 1974, a similar temple was discovered at nearby San José Mogote—Structure 13, set atop Mound 1 (Flannery and Marcus 1976a: 218). Although partially preserved, Structure 13 appeared to be 1.5 times as big as the temple in Mound X—perhaps because it was a major temple at San José Mogote while Mound X was a relatively minor one at Monte Albán. Assuming that Structure 13 was symmetrical, with the same proportions as the Mound X temple, it would have measured some 15 m by 8 m. In addition to its greater size, Structure 13 had pairs of columns to either side of the vestibule doorway (Fig. 2c). Both Structure 13 and the Mound X temple were oriented to the cardinal points (*ibid.*: 218).

In 1958, Bernal reported on a similar Period II temple in Mound I-bis at Cuilapan, Oaxaca, excavated in 1902 by Marshall Saville. Constructed of huge adobes, the temple has columns to either side of the inner and outer doorways (Fig. 2b). The temple was later rebuilt several times, and associated with the third building stage (dating to the Monte Albán IIIa period, about A.D. 300) was an apparent dedicatory offering including a sacrificed child. The child's body was covered with hematite pigment and accompanied by 17 jade figurines, 400 jade beads, 35 marine shells, 2 pottery ear spools, and disintegrated mosaics of shell, obsidian, and hematite (Bernal 1958: 25). The context of the find, the lack of ceramic vessels or any conventional grave or tomb, and the similarity of the offerings to some found in Mound I at Monte Albán indicate that this was an important offering rather than a burial.

Inside the solid adobe hearting of Mound III at Cuilapan, another temple pyramid, Bernal found a massive offering. This one included 71 jade beads, 157 beads of various other stones, 2 jade earspools, 3 obsidian blades (of the type used for ritual bloodletting by the Zapotec), 8 marine shells, 3 stones, a pearl, and 'numerous bones of small animals' including 'skull and bones of bird' (Bernal 1958: 79, 91-2). The latter are presumably quail, doves or other small birds of the type frequently sacrificed by the Zapotec. This offering dated to approximately A.D. 700 (Monte Albán IIIb-IV).

Perhaps the most famous Zapotec temples are those of Mitla in the eastern valley of Oaxaca. Many of Mitla's buildings date to A.D. 1100-1500 and have never been below ground; their state of preservation is remarkable. The two largest belong to the so-called 'Grupo de las Columnas,' which was first described by Alonso de Canseco in 1580 (del Paso y Troncoso 1905-6: vol. 4). Each consists of a rectangular patio flanked on three sizes by monumental buildings with intricate *greca* designs formed from stone mosaics. The small mosaic elements, as well as the giant lintels weighing up to 25 tons, are of easily worked volcanic tuff. According to Dupaix (quoted by del Paso y Troncoso 1905), the Mitla 'palaces' were roofed with beams of *Taxodium* (bald cypress) 'as thick as a man,' over which were laid flat stone slabs; then came a metre of lime, sand and earth, all covered with a kind of pre-hispanic concrete.

The most southern of the two buildings is the so-called 'Patio of the Tombs,' which was evidently a civic-administrative structure. According to Canseco (1580), it was in the halls fronting this patio that problems of 'government and republic' were dealt with, and the great lords of the region 'came together to get drunk and enjoy themselves in their heathen way.' Under the patio (and extending back under the halls) are the famous cruciform tombs which were for 'burial of the great lords of this realm.'

The most northern of the two buildings is the 'Hall of Columns,' which was evidently a religious structure. 'In this building they had their idols, and it was where they assembled for religious purposes, to make sacrifices to their idols, and to perform heathen rites' (Canseco 1580: 152). There is an adoratory or altar (*pecogo*) in the center of the patio, and the western and eastern halls have pairs of columns. The largest hall, on the north side of the patio, has six huge columns and is attached, by means of a narrow, indirect passageway, to an additional four-room structure with an interior courtyard. This additional structure, according to Canseco, was the residence of a priest who was 'like our pope': supreme head of the pre-Columbian 'church.' The residence, evidently that of a *uijo-tào*, is described as windowless but elegant, clearly intended to have great privacy and extremely limited access (Fig. 3).

It is, in fact, not hard to picture the evolution of this religious structure out of the less elaborate two-room temple of Monte Albán II-IIIb times. Both have an outer room, or antechamber, reached by a flight of stairs and entered by a wide doorway with large columns; this room would presumably have been accessible to secular nobility and perhaps even to the commoner class. Both also have an interior enclosure, reached by a narrow doorway, which would have been a windowless inner sanctum to which only priests had access. In short, the archaeological evidence conforms reasonably well to the ethnohistoric descriptions.

Maya Religion: The Ethnohistoric Evidence

Major ethnohistoric sources on the Maya include the three extant pre-Columbian codices or hieroglyphic books, dating from A.D. 1250-1450, that are currently found in Dresden, Paris and Madrid. Another source is the manuscripts written by the Yucatec Maya in European script after the Spanish Conquest; these contain prophecies and data concerning historical and religious events. Various Colonial Spanish writers also

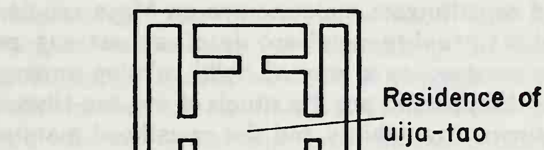

Figure 3. Plan of temple and priest's residence from 'The Hall of Columns' at Mitla, Oaxaca (redrawn from Marquina 1964).

Table 1. A reconstruction of the religious hierarchy among the Zapotec and Maya.

Rank	Zapotec	Maya
First	*uija-tào, vuijatào* 'great seer'	*ah kin mai, ahau can mai,* 'high priest'
Second	*copa pitào,* 'priest' *bigaña,* 'young priest, student priest'	*ah kin* 'priest'
Third		*chilan,* 'mouthpiece,' 'interpreter'
	ueza-eche, huetete, 'sacrificer'	*(ah)nacom,* 'sacrificer'
		chac, 'lightning' (four individuals painted blue holding victim's limbs)
	colanij 'diviner'	*(a)hmen,* 'diviner'

made significant contributions—particularly Diego de Landa, bishop of Yucatán, a Franciscan missionary who arrived in 1549. His *Relacion de las cosas de Yucatán* was written in 1566 and constitutes a major source on Maya religión. Additionally, more recent ethnographies provide excellent detail on various pre-Hispanic religious practices that have survived as a kind of 'folk' religion among contemporary Maya Indians. What have disappeared are the rituals of the pre-Hispanic Maya ruling class. In pre-Columbian times, the nobility and the priesthood maintained secret practices on behalf of large territorial and political units (sometimes referred to as a 'state' religion), and much of this knowledge vanished with them.

When one turns to books on pre-Columbian Maya religion, one is usually overwhelmed by the number of 'gods' enumerated (250 by one count) and their overlapping aspects or 'spheres of control.' Usually, scholars refer to these 'gods' collectively as a 'pantheon,' although sometimes with misgivings.

> In considering the nature of Maya gods, we may first rid ourselves of certain misconceptions by noting that in our field the term *pantheon* should not be taken in its strictly Greek sense. The idea of a general assembly of gods finds no place in Maya theology, and the visions of the behavior of the very carnal gods of Greece and Rome that the word conjures up would have been rated by the Maya as conduct totally unbecoming divine beings (Thompson 1970: 198).

As in the case of the Zapotec, I feel we can challenge the notion that the Maya had a pantheon of anthropomorphized gods during the Classic Period (A.D. 250-950). Rather, supernatural beings were depicted in Maya art by combining parts from different animals (snake, iguana, crocodile, quetzal, parrot, jaguar and so on) into fantastic creatures that would never have occurred in nature (Spinden 1913). Why,

then, have we persisted in referring to a Maya pantheon? The reasons are largely historical. The German scholar Schellhas (1904) classified the figures in the three Postclassic Maya codices as 'gods,' giving each a letter designation ('God A,' 'God B' etc.). Since that time, considerable effort has been expended in identifying more 'gods' in the monumental art of the Classic Period, as well as in matching up the names of the 'multitude of gods' mentioned by Landa (and other sixteenth-century friars) with depictions from the Classic.

As noted by Morley and Brainerd (1956: 225), during the Classic Period the Maya were not worshippers of images. Most scholars relying on ethnohistoric sources and archaeological information from Yucatán agree that 'idolatry' was introduced into Yucatán by the Nahua speakers of the Postclassic era (A.D. 950-1520), who brought with them the practice of making idols. Once the Nahua influences are removed, ancient Maya religion looks more similar to ancient Zapotec religion.

In the Maya version of animatism, the word '*ku*' ('sacred,' 'divine') played a role as important as did the concept of *pè* among the Zapotec. The addition of *ku* transforms a house or structure (*na*) into a temple (*kuna*); it transforms wood (*che*) into sacred cedar wood (*kuche*) for carving a statue to honor one's ancestor. In addition, the Maya had an even more exact equivalent for *pè*: the word *ik*, which also meant 'wind,' 'breath' and 'life.'

Turning to the 1590 Motul dictionary (1929: 404-5) we find the Maya equivalent to the Zapotec supreme being: *Hunab ku*, 'the only live and true god.' Like his Zapotec counterpart, no images were ever made of him, because 'being incorporeal, he could not be pictured.' López de Cogolludo (1867-8: book 4, chapter 6) says that 'from *Hunab ku* they said that all things proceeded, they did not worship him by putting up idols.' *Hunab ku* had created many of the other things regarded as sacred—lightning (*chac*),[1] fire (*kak*), the sun (*kin*), the moon (*u*), caves and so on. Like the Zapotec, the Maya also revered their ancestors, with royal ancestors being particularly important. And everything possessing *ik* was treated with respect: animals, trees, maize, and the earth were alive and required propitiation. When a Maya 'cuts down the forest to make his milpa, he apologizes to the earth for "disfiguring" its face; when he kills a deer, he excuses the act on the grounds of his need' (Thompson 1970: 165). Indeed, in the Maya mind the earth was not merely alive but sacred, and referred to as *ch'ul balamil* (*ch'ul*, 'sacred'; *balamil*, 'earth'). Information collected in San Pedro Chenalhó (Guiteras-Holmes 1961: 287) indicates that the earth still 'claims the clearing, the home, and the cultivated fields; although once her permission is obtained by man to live on her, she will not indiscriminately harm him.' Rain clouds are thought to come forth from caves in the hills, and the springs and waterholes are earth's gifts to man. The caves are the doors to hills and are feared, as are the forests and other places where the sun cannot reach.

Like the Zapotec, the Maya had a full-time priesthood with an internal hierarchy (see Table 1), who conducted important rituals in permanent temples of various types. The community temple was known as *ku* or *kuna*. Landa (1941: 108) reports that in addition to these community temples of cut-stone masonry, 'the lords, priests and the leading men had also oratories and idols in their houses, where they made their prayers and offerings in private.' Landa clearly separates the temple structure from the domestic structures, although rites, offerings, and prayers were made in both; we see evidence for public religion and private religion, and communal rites versus household ritual. 'The common people also had private idols to whom they sacrificed, each one according to his calling or occupation which he had' (*Relación de Mérida* in Landa 1941: 108).

Sixteenth-century women are described as being very devout, burning incense before the 'idols,' offering cotton cloth, foods and beverages. But Landa (1941: 128-9) says that women did not have the habit of shedding blood to their 'idols' and that they were not allowed to go to the temple for sacrifices, except on one occasion involving only the old women. Tozzer (1907: 104-5, 108) says that early twentieth-century Lacandón Maya women were also deprived of any active role in religion, being allowed to enter the sacred enclosure only at the very end of the ritual when the feast began. We will see that archaeological data from the Classic Period present a somewhat different picture of the role of women.

Now let us consider the hierarchy within the Maya priesthood. In the sixteenth century the high priest was known as *ah kin mai* or *ahau can mai*. Respected by the Maya ruler, who gave him offerings, this priest was said to have been succeeded in office by his son or a near relative (Landa 1941: 27). The role of the *ah kin mai* was primarily as adviser to the ruler; additionally, he taught the sons of other priests, as well as the second sons of the lords from infancy. Priests controlled calendrical knowledge (such as the timing of festivals of the 260-day ritual calendar) as well as various methods for divination and prophecy. Landa's data (1941: 29) also indicate that knowledge of hieroglyphic writing was the sole possession of the Maya priests and 'some of the principal lords.'

Ordinary priests were known as *ah kin*, and below them were religious functionaries with more specialized roles. These included the *(ah) nacom*, who offered human sacrifices (the equivalent to the Zapotec *ueza-eche*). Four *chacs* (impersonators of lightning) held the limbs of the victim while the *(ah) nacom* removed his heart and gave it to the *ah kin*. While the *ah kin* was held in great respect, the *nacom* who performed the sacrifice was not.

The *chilan* was a kind of ritual 'interpreter' whose duty was 'to give the replies of the gods to the people, and so much respect was shown to them that they carried them on their shoulders' (Landa 1941: 112). Then there was the *(a)hmen*, or 'diviner,' a more lowly religious practitioner whose office—in many parts of the Maya region—is the only one still surviving (Redfield 1941).

In addition to letting their own blood with stingray spines, obsidian blades or knotted cords, the priests sacrified birds, animals and fish. They also offered food and fermented beverages, placing them on altars in the courts of the temple and on top of the staircases. In the Sotuta and Homun testimony (Scholes and Adams 1938: 101) the most common victim of sacrifice, following human beings, was the domestic dog. Additionally, the offering of a wild peccary or deer was also common.

Landa mentions other methods of human sacrifice—arrow sacrifice, flaying, throwing the victim into a *cenote* or natural sinkhole in the limestone, hurling the victim from a precipice. According to the Sotuta and Homun testimony the victim was sometimes killed by decapitation; others had their hearts cut out while tied to a ladder with arms outstretched. Children were also sacrificed, some of these being orphans, others purchased or even kidnapped.

Archaeologists should be encouraged by the descriptions of the way Maya of various statuses were buried. Ordinary men were wrapped in a shroud, ground maize placed in their mouths along with some green stones or small jade beads; such people were buried inside or in the rear of their houses. A priest might be buried with some of his books (codices). A man who had been a diviner was buried with his stones for divination (*am*), as well as other instruments of his profession. One could thus seek corroboration between Landa's data and the archaeological record. Kidder (1935: 112), for instance, in excavating a burial at San Agustín Acasaguastlán, Guatemala,

found laminated pink and green stucco (lime sizing) which may represent the pages of a codex buried with a priest; a few similar examples have been found.

For the nobility the treatment after death was different—they were cremated, with their ashes being placed in urns, and later the Maya built temples above their burials as in the case of some Zapotec. Landa (1941: 130-1) clearly says that the commoners were buried in or near their houses, while cremation was reserved for nobles and persons of 'high esteem':

> The rest of the people of position made for their fathers wooden statues of which the back of the head was left hollow, and they then burned a part of the body and placed its ashes there, and plugged it up; afterwards they stripped off the dead body the skin of the back of the head and stuck it over this place and they buried the rest as they were wont to do. They preserved these statues with a great deal of veneration among their idols. They used to cut off the heads of the old lords of Cocom, when they died, and after cooking them they cleaned off the flesh, and then sawed off half the crown on the back, leaving the front part of the jaws and teeth. Then they replaced the flesh which was gone from these half-skulls by a kind of bitumen, and gave them a perfect appearance characteristic of those whose skulls they were. They kept these together with the statues with the ashes, all of which they kept in the oratories of their houses with their idols, holding them in very great reverence and respect.

At Chichén Itzá, Uaxactún, and Holmul, urns with such cremated remains have been found (E.H. Thompson 1938; Morris, Charlot, and Morris 1931; Ricketson and Ricketson 1937; Merwin and Vaillant 1932). From the Cenote of Sacrifice at Chichén Itzá, a skull with crown cut away, eye sockets filled with wooden plugs, and painted plaster covering the face has been found (Tozzer 1941: 131 Ft. 613).

Thus, there are a number of elements in Maya religion for which archaeological evidence might be sought: (1) the temples (*kuna*) which were the architectural manifestation of Maya religion; (2) burials of priests who conducted major rituals for the nobility and the community as a whole; (3) the rituals themselves, including the burning of incense (*pom* or copal), human sacrifice, animal sacrifice, ritual bloodletting and cannibalism; (4) and ancestor worship. Temples, burials, caches, murals, painted and carved ceramics and carved stone monuments supplement and serve to corroborate most of the ethnohistorical sources, as well as providing information about topics not discussed by the sixteenth-century chroniclers.

Maya Religion: The Archaeological Evidence

An early Maya temple broadly contemporary with the Period II temples at Monte Albán, sits atop Pyramid E-VII-sub at Uaxactún (Ricketson and Ricketson 1937). Structure E-VII-sub had a total height of 8 m, while at ground level it measured 24 m north-south, and 23 m east-west. Its upper platform, however, apparently did not support a two-room masonry temple; rather, two postholes in each room suggest that it may once have supported a pole-and-thatch structure (Fig. 4a). Ricketson and Ricketson (1937: 72-3) mention additional evidence that some Maya pyramids supported thatched structures, citing representations of such in graffiti from Tikal (Maler 1911: 57, 59). Later, however, these postholes at E-VII-sub were sealed over, indicating to Ricketson that the thatched structure was only a temporary one. He suggests that the eventual function of Pyramid E-VII-sub was as an 'enormous altar, open to the air,' reached by stairways on all four sides.

By the Tzakol phase (A.D. 250-500), there are clear Maya temples with stone masonry walls, a division into 'inner' and 'outer' chambers, and a single stairway. For

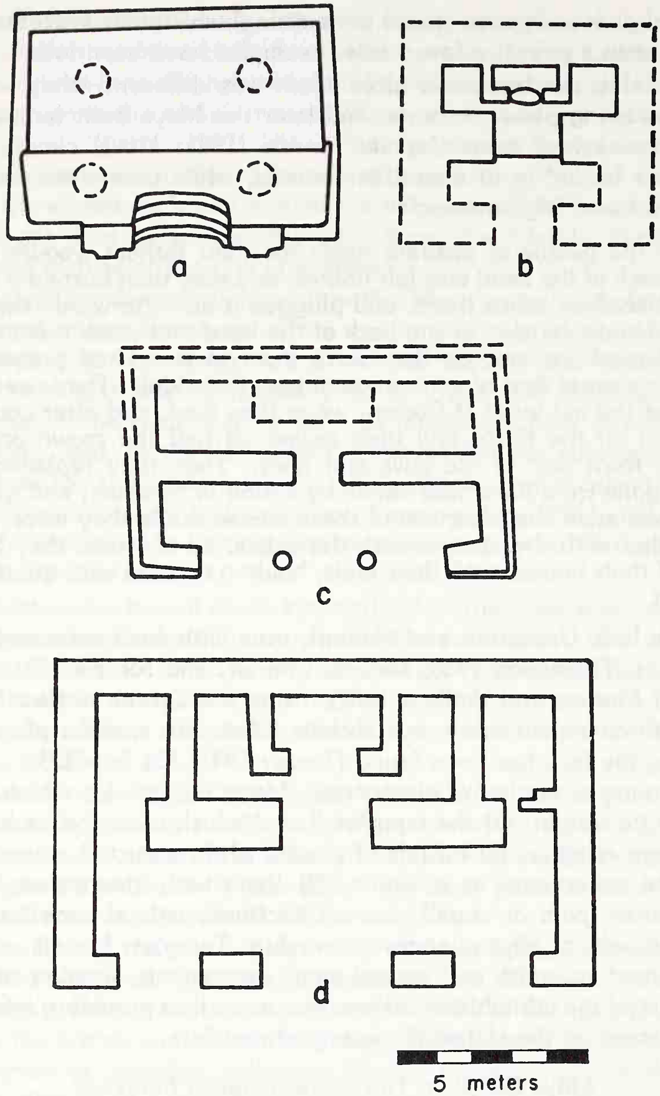

Figure 4. Ground plans of Maya temples: (a) Structure E-VII-sub, Uaxactún (redrawn from Ricketson and Ricketson 1937); (b) Structure E-I, Uaxactún (redrawn from Ricketson and Ricketson 1937); (c) Temple of the Wall Panels, Chichén Itzá (redrawn from Ruppert 1931); (d) Temple of the Cross, Palenque (redrawn from Marquina 1964).

example, Temple E-I at Uaxactún stood on a rectangular platform 3 m high and 10 m square; this platform was reached by a stairway of seven or eight steps on the west face. The stairway was 4 m wide and projected 60 cm beyond the front line of the platform.

As in the case of the Zapotec temples, Temple E-I consisted of two small rooms, a more accessible anterior room (4.5 by 1.4 m), and a less accessible interior room (5.1 by 1.5 m) which is 37 cm higher (Ricketson and Ricketson 1937: 47). The interior room contained a large altar constructed of rubble-fill inside plastered stone blocks. The altar was 60 cm high, 2.4 m long, and 1.1 m wide, and was enclosed by two

L-shaped walls; one step was cut into the front edge of the altar (Fig. 4b). In the floor south of the altar was Cist 2, a cache containing two redware dishes, set lip to lip, containing a set of human teeth and fragments of a skull, nine jade beads, two small jade ear plugs, and a jade pendant representing an animal head (Ricketson and Ricketson 1937: 50).

A Postclassic Maya example of a two-room temple is the Temple of the Wall Panels at Chichén Itzá (Ruppert 1931). The outer room has a very wide doorway (6.71 m) with two columns within it. The inner room doorway is much narrower (1.35 m). An altar occupies a central position along the back wall of the sanctuary (Fig. 4c). One could find dozens of additional Classic and Postclassic examples, but there is no space in a paper of this length to mention them all.

Structures E-VII-sub and Temple E-I represent two different kinds of pyramidal structures which coexisted in the Maya Classic, each with its separate functions. One type was the so-called 'sacrificial pyramid,' with four stairways ascending to a flat, structureless top; the other was the typical 'temple-pyramid,' with only one stairway ascending the main side to the door of a two-room stone masonry temple. In the Postclassic period (A.D. 950-1520) these two architectural types may have coalesced in the Castillo at Chichén Itzá (Marquina 1964: 848).

Archaeological data for Maya ritual in general, and for sacrifice in particular, are abundant. The act of bloodletting was represented on stelae (free-standing stone monuments), lintels, murals, and ceramics during the Late Classic Period (A.D. 600-950). Specifically, blood was let from the tongue, the ears and the fleshy parts of the arm; it was collected on bark paper in baskets or ceramic bowls, and then presented as a gift to the supernatural.

Stingray spines were also employed to draw blood. Landa (1941) in fact states that stingray spines were customarily buried with a priest as a mark of his office. Stingray spines have indeed been recovered from many Maya sites in burials, and imitations in bone have also been found. Thompson (1966: Fig. 23b), utilizing Landa's data, interprets the burials including stingray spines as being those of priests; for example, at Uaxactún c. A.D. 550, a man was buried full-length, face down, with red ochre on his bones. Offerings in this burial (A22, Structure A-V) included thirty-five vessels of the Early Classic period, earplugs and beads of jade and shell, jaguar teeth, a stingray spine painted red, burned and unburned copal nodules, charcoal and a bone tube (Smith 1950: 121).

Obsidian blades were also employed for bloodletting. With these or other implements, a hole could be made in one's tongue and then a cord set with thorns could be passed through it; this method of offering one's own blood is represented on Yaxchilán stone monuments (Lintels 17, 24; Maudslay 1889-1902: Plates 85, 86). What is significant in this case is that the individuals drawing the cord set with thorns through their tongues are women. This clearly contradicts Landa's sixteenth-century descriptions, since he specifically states that women's blood was not shed, and that they were not allowed to go to the temples for sacrifices except during one festival involving old women (1941: 128-9; Herrera 1941: 219-20). Landa's data may therefore apply only to the Postclassic situation, and possibly (?) only to middle or lower class women. It is clear that the women depicted on the lintels at Yaxchilán were nobility, most probably the wives of the rulers depicted on the same monument.

Several monuments showing a woman holding a vessel of blood-spattered papers are known. The earliest example appears at Naranjo on Stela 24. The 'woman-with-blood-spattered-papers-in-a-vessel' motif, as well as the 'bloodletting' glyph, are most frequently the subject matter of lintels, but at Naranjo a woman from Tikal is shown

on two stelae (nos 24 and 29; Maler 1908: Plates 39, 41) holding a vessel. Lintel 24 at Yaxchilán shows a woman with a cord set with thorns passing through her tongue and the text includes the 'bloodletting' hieroglyph (Proskouriakoff 1960: Fig. 8c); she is probably the wife of the ruler *Shield-Jaguar*. Yaxchilán Lintels 43 (Maler 1903: Plate 67), 41 (Morley 1937-8: 5: Plate 178B), and 17 all date to the reign of his successor, *Bird-Jaguar*.

There is also an important bloodletting ceremony depicted in a mural painting in Room 3, Structure 1, at Bonampak (Ruppert, Thompson and Proskouriakoff 1955: Fig. 29). This ceremony occupies the upper half of the east end wall. Seated on top of a large bench or table are three persons in long gowns. The central figure is probably the wife of the ruler; behind her is a younger woman who has been tentatively identified as their daughter. In front of the woman is the Maya lord himself, apparently in the act of drawing blood from his tongue. The ruler is inserting a white object (bone, stingray spine?) into his tongue while a male attendant, kneeling at the front of the massive altar, is shown holding two more objects with very sharp points. Resting in front of the ruler is a large spiked vessel containing bark paper strips. For Thompson (1955: 54-5) the scene clearly represented a ceremonial offering of blood, as one of the rites preparatory to a cycle of other ceremonies. This scene can be dated to roughly A.D. 800.

We also have good evidence for human sacrifice in the archaeological record. For example, on Stela 11 at Piedras Negras (Maler 1901: Plate 20) a victim is shown stretched over a stone altar at the base of a ladder leading up to the temple, where the ruler is seated on his throne; instead of blood emanating from the open wound of the victim there are long feathers which Thompson (1970:176) suggests are quetzal feathers, symbolizing something precious—a definition the Maya applied to human blood. In the Dresden Codex, a tree is shown emanating from the wound after the removal of the victim's heart (Thompson 1972: 123). On a gold disk recovered from the Sacred Cenote at Chichén Itzá, a victim is stretched over a stone altar with a gaping wound clearly shown; four assistants hold down the limbs of the victim, most probably the *chacs* or 'lightning impersonators' referred to by Landa. This form of sacrifice seems to be the most common form, although others are known. Immediate sacrifice of victims taken in raids was a common practice, as was the offering of children and adults to the *chacs*, lightning beings that were purported to live in the cenote at Chichén Itzá.

At one time or another, a great variety of living things and inanimate materials were given in sacrifice. Archaeological data reveal caches containing manatees, jaguars, opossums, parrots, quail, owls and turtles (Thompson 1970; 182). Colonial sources and modern ethnographies document more recent sacrifices of dogs, deer, turkeys, iguanas, pumas, crocodiles or caymans, squirrels, insects and feathers. The sixteenth-century sources list dogs, deer and turkeys in greatest frequency.

Copal incense was offered, and has been found archaeologically. Additionally, rubber, cacao, maize, squash seeds, flowers, pine boughs and needles, as well as the fermented beverage *balche* (honey and bark of the tree *Lonchocarpus longistylus*) are listed ethnohistorically. Honey, wax, *zuhuy ha* (uncontaminated or 'virgin' water collected from cenotes and caves), jade, obsidian, shell and iron pyrite mirrors were also offered. Children were also considered to be *zuhuy* (virgin or uncontaminated), and were thus appropriate offerings to the supernatural beings and forces, particularly to lightning.

The dedication of buildings and stelae called for 'wealthy' offerings included in the cache—jade, shell, obsidian and other imported items. The communal offerings

for public buildings and public religion contrast with the offerings made by the lower class farmers in their fields and family altars—ceramic vessels, copal, food and drink.

Summary and Conclusions

Obviously, in a paper this brief there are only a few conclusions that can be drawn. However, the Zapotec and Maya share so many principles that I believe we can see the outlines of an ancient, basic and widespread religious pattern that existed in Southern Mesoamerica before the incursions of Nahua speakers into that area.

That pattern would include the concepts of a vital force expressed as 'wind,' 'breath' or 'spirit,' glossed *pè* by the Zapotec and *ik* by the Maya. It included lightning as a powerful supernatural (Zapotec *cocijo*, Maya *chac*), sometimes taking the form of four *cocijos* (as in the Zapotec 260-day calendar) or four *chacs* (in the Maya universe). It also included an animatistic view of the world in which everything that moved deserved respect.

Both Zapotec and Maya constructed temples with a highly sacred inner room and a less sacred outer room. Both had a religious hierarchy which included high priests, common priests, sacrificers and diviners. Both offered in sacrifice their own blood, birds and animals, children, and capitves taken in war. Both revered their own ancestors and constructed memorial buildings above royal ancestors. Zapotec royal ancestors may have been commemorated in tomb murals as early as the Classic Period, while Maya royal ancestors were commemorated with carved stelae during the same period. On all these subjects, the archaeological record provides confirmation for the ethnohistoric sources.

On the other hand, the archaeological record shows that Classic Maya woman may have played a greater role in religion and in temple activities than the sixteenth-century documents would suggest. It also shows that 'idols' were not an important part of Maya ceremonialism until the Postclassic arrival of Nahua speakers. In such cases, archaeology can be used to correct ethnohistoric models, or establish the time depth to which they may be valid. Such feedback between the two lines of evidence will strengthen both archaeology and ethnohistory.

Finally, our examination of these two peoples using two subdisciplines suggests that the Zapotec and Maya did not have a vast Greco-Roman style pantheon of anthropomorphized gods, as has sometimes been supposed. While this topic surely deserves further research (Marcus and Flannery n.d.), it appears that both peoples believed in a single, supreme, incorporeal 'creator' and a series of great supernatural forces which they represented by combining aspects of different creatures. Cloud and earthquake were relatively more important for the Zapotec, sun and moon relatively more important for the Maya. In both areas, the early Colonial Spanish underestimated the role of the ancestor worship and mistook venerated, deceased royalty for gods. At the same time, such is the richness of the ethnohistoric data that the sixteenth-century writers left us many of the clues we need to correct their misunderstandings, and put the archaeology and religion of southern Mesoamerica on more solid ground.

—1978

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Note

1. Although most Maya scholars have defined *chac* as 'rain god' (Thompson 1966: 123; Morley and Brainerd 1956: 196-7), there is considerable evidence that *chac* refers to lightning, thunder and thunderbolts. For example, in Tzotzil *čauk* means 'thunder, thunderbolt, and lightning' (Laughlin 1975: 111), while *vo?* refers to rain. Pio Pérez (1898: 29) gives *Haɔchac* as 'lightning bolt' (*haɔ*, 'whip,' and *chac* 'lightning'); for 'thunder' he gives *pecchac* ('the movement of lightning') (*ibid.*:64). Rain, on the other hand is composed of compounds of *ha*, 'water,' e.g. 'to rain' = *kaxal ha*; 'to drizzle' = *toz ha*. This is equivalent to the Zapotec situation, where *cocijo* = 'Lightning' and 'rain' is simply a form of *nica*, 'water' (Cordover 1578a).

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24

Architectural Implications of Daily Life in Ancient Tollán, Hildalgo, Mexico

by Dan M. Healan

The study of pre-Columbian architecture is a long-established and fruitful field of inquiry in Mesoamerican prehistory (*e.g.* Kubler 1962; Margain 1971; Marquina 1951; Proskouriakoff 1946; Robertson 1963). This is largely because of the general Mesoamerican practice of constructing elaborate and durable politico-religious works on a monumental scale. Recently there has been a growing interest in the study of non-ceremonial residential architecture in Mesoamerica, particularly in terms of what insights it may provide into the little-known domestic realm of pre-Columbian settled life (*e.g.* Flannery 1976). One of the least-known domestic realms has been that of pre-Columbian urban centers. Recent work by Millon (1970; 1973; 1976) at Teotihuacán, Calnek (1972; 1976) at Tenochtitlan, Winter (1974) at Monte Alban, and Haviland (1970) at Tikal has provided a flood of complex and highly variable information on how man in pre-Columbian Mesoamerica adapted to life in an urban setting. From 1970 to 1972 the University of Missouri conducted excavations in a residential sector of the ancient Toltec City of Tollán in Central Mexico. While analysis of other artefacts is still in progress, the available architectural data is already providing insights which, when considered along with the results of the forthcoming artefact analyses, should shed much light upon the relatively little-known domestic realm of Tollán.

The Site of Tollán

Tollán (or Tula), the capital city of the Toltec empire in Central Mexico, is generally considered to be early Postclassic in date (roughly A.D. 900-1200), but it could have been settled considerably earlier, perhaps prior to the destruction of Teoti-

huacán around A.D. 750 (Diehl 1976:261). Archaeological and ethnohistoric data indicate the city flourished and declined prior to the appearance of the Aztec state.

The ruins of Tollán are located in the state of Hidalgo, some 70 km north of Mexico City (Fig. 1). The ruins are primarily situated on an elongated limestone ridge overlooking the valleys of the Tula and Rosas Rivers and the modern town of Tula de Allende (Fig. 2). A large ceremonial precinct referred to as the acropolis has been extensively excavated and reconstructed by Jorge R. Acosta of the Instituto Nacional de Antropología e Historia (INAH). It is clear that the acropolis comprised the political and religious center of ancient Tollán.

The truly urban character of Tollán has been confirmed by two extensive surface surveys conducted by the University of Missouri and INAH. Both surveys indicate that at its height Tollán encompassed an area of from 10½ to 14 km^2 in size (Yadeun Angulo 1974: 53; Stoutamire 1974: 13), extending into the adjacent river valleys and surrounding hills (Fig. 2).

The University of Missouri's programme of residential excavations at Tollán was directed by Richard A. Diehl under a series of grants from the National Science Foundation. The excavations were conducted in an area sufficiently removed from the acropolis to be most likely in a non-elite residential area of the ancient city; the area selected was approximately 1½ km north-east of the acropolis near the city's edge (Fig. 2). Two localities were excavated within this area. One locality was situated near *El Corral*, a circular temple pyramid reconstructed by Acosta, and is referred to as the Corral Excavation. The other locality was situated near the Endho irrigation canal and is referred to as the Canal Excavation. This paper will be concerned only with the Canal Excavation, with which I was involved.

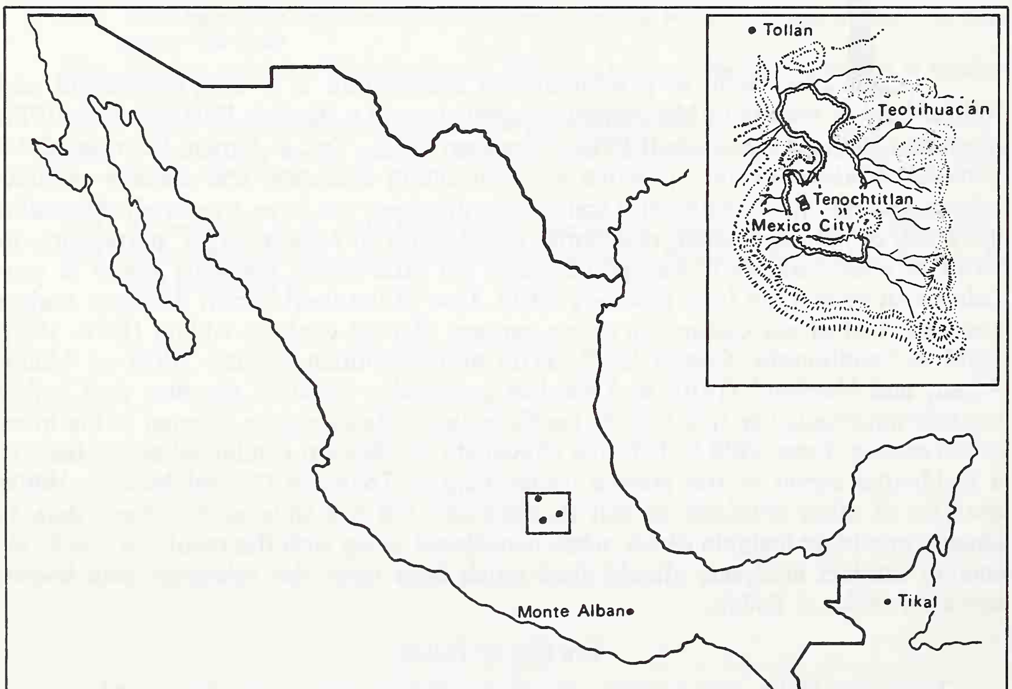

Figure 1. Location of ruins of Tollán in Mexico, with respect to the ruins of other pre-Columbian cities in Central Mexico discussed in text (inset).

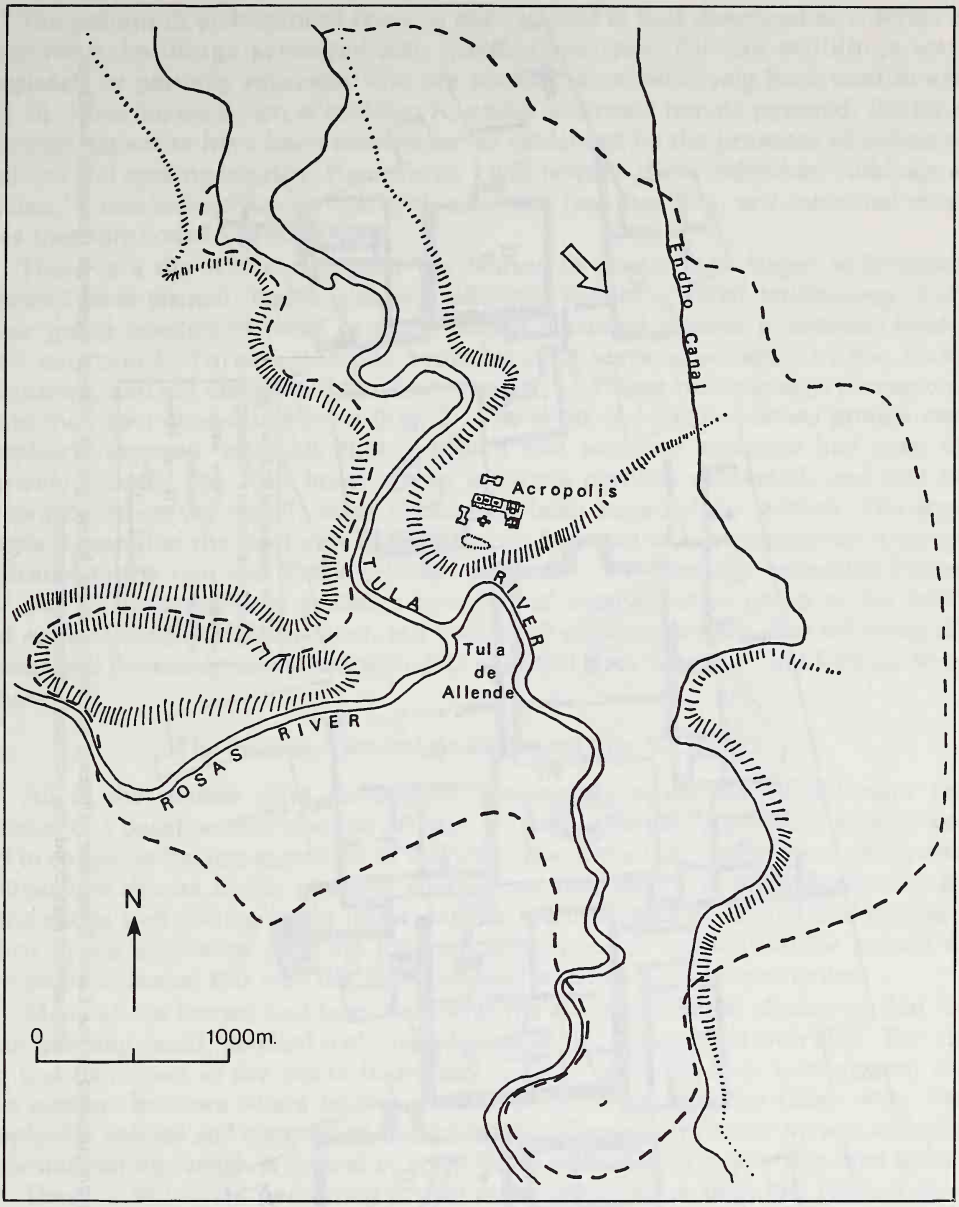

Figure 2. Map of the region of ancient Tollán, showing approximately urban limits (broken line) and location of University of Missouri residential excavations (arrow).

The area around our excavations was littered with artefact debris, and has an undulating topography with numerous low rises which apparently represent the remains of collapsed structures. In 1970 test pits were placed atop a low rise and architectural remains were encountered. Subsequent field seasons were spent enlarging these pits so that an area of about 1,800 m^2 was eventually exposed (Fig. 3). Our excavation strategy was to expose only the first architectural remains encountered below surface, but a number of stratigraphic pits were dug to bedrock to provide a more complete picture of the occupational history of the vicinity.

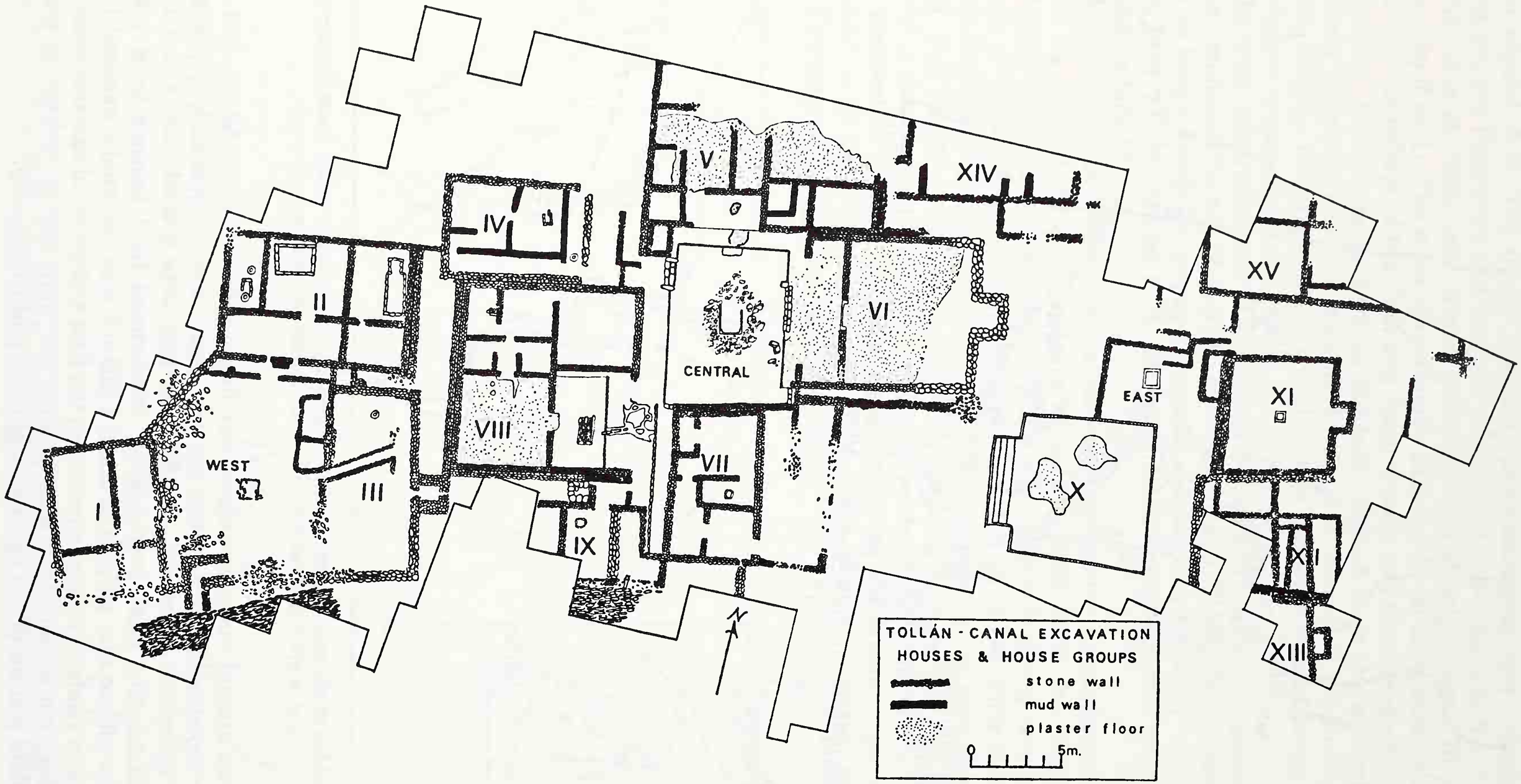

Figure 3. Architectural remains encountered in the Canal Excavation, showing location of major house groups. Roman numerals designate buildings discussed in text. Solid line indicates limits of excavation.

The pattern of architectural remains encountered is best described as a series of multi-room buildings arranged into distinct clusters. Fifteen buildings were completely or partially excavated and are numbered consecutively from west to east (Fig. 3). With the exception of building X, which is a small temple pyramid, the other buildings appear to have been residences, as evidenced by the presence of utilitarian artefacts and cooking hearths. Henceforth, I will refer to these individual buildings as 'houses,' a less awkward term that aptly connotes free-standing, self-contained structures that functioned as residences.

There is a distinct tendency for the houses to cluster into larger architectural entities I have termed 'house groups,' following Kubler's (1964) terminology. Each house group consists of three or more houses clustered around a centrally located open courtyard. Three principal house groups were uncovered in the Canal Excavation, and are designated the East, Central, and West house groups corresponding to their east-west distribution (Fig. 3). The West and Central house groups were completely exposed, although their northern and southern extremes had been extensively eroded. The East house group was only partially excavated, and will not be considered in any detail, since it has only been superficially studied. The small temple pyramid of the west side of the group is believed to have supported a temple dedicated to the rain god Tlaloc (Stocker 1974: 29). The partially excavated Houses XIV and XV may mark the southern boundary of another house group in the northeast edge of the Canal Excavation, but both were severely eroded. The following discussion will be mainly concerned with data obtained from the West and Central house groups.

The Houses: General Architectural Characteristics

All of the houses were rectangular single-story structures. Walls were constructed of a basal portion of stone perhaps a meter in height, over which adobes were laid to comprise the upper portion of the wall. The stone wall portion was constructed of limestone chunks laid in irregular courses and mortared with mud. Rarely was any of the adobe wall portion found intact, but the relatively low density of building stone debris in the excavation plus the frequent occurrence of 'melted' adobe around the wall stubs indicates this was the most common method of wall construction.

Many of the houses had been built over the remains of older structures that had been partially razed, levelled with the addition of fill, and capped with clay. The clay cap was then used as the house floor, and in some cases the floor was covered with lime plaster. In cases where houses were built on virgin soil, the floors were often simply the natural soil compacted by foot traffic. These floors were uneven and often quite undulating, which is typical of earth floors of houses in use in this area today.

There is little data pertaining to roof construction other than two charred beam fragments. It seems probable that flat roofs consisting of beams with crosslaid poles were employed, since this is characteristic of pre-Columbian architecture in Central Mexico (Margain 1971: 56).

Each house had but one entranceway, which commonly had some kind of architectural elaboration, such as the stepped entranceways of Houses I and II and the use of decorative carved stone facing on Houses V and VI. Traces of wood posts were found framing the entranceway of House II and interior doorways of Houses VI and VIII. Most interior doorways, however, were rather modest affairs. Within the well-preserved House VIII were found several doorways which were merely low dips in the walls that did not extend to the floor; hence, the wall base was unbroken. The use of such doorways may explain the lack of gaps in the interior wall bases of less well-

preserved houses, which otherwise give the impression of having doorless rooms.

Several architectural elements that might be collectively referred to as decorative facings were employed in some of the houses, and their differential use may be an indication of differential status of the occupants. These facings include the use of lime plaster on floors and walls, carved roof trim consisting of a soft volcanic stone, and decorative veneers. The most common veneer was a facing of small tabular pieces of limestone laid in regular courses; this facing is commonly called 'small stone' facing, and is quite common on the ceremonial structures of the acropolis.

Within some of the houses were found both subfloor adobe-lined pits and above floor boxes constructed of stone slabs (Fig. 4(a)). Large ollas were occasionally found recessed into the floors (Fig. 4(b)). Other storage facilities are indicated by small rooms found inside or adjacent to some of the houses.

Hearths indicative of cooking areas were found inside of five of the houses in the West and Central house groups (Fig. 4(c)). Two types of hearths were noted: an open type surrounded by rocks or clay walls and a subfloor 'firebox' lined with broken *metates*. Hearths were not found in Houses I, III, V, or VI, but all of these had sustained severe erosion to some part of their floors so that existing hearths may have been destroyed. Another possibility is that portable braziers were used for cooking in houses with plaster floors; brazier fragments were frequently encountered in the house debris. Sanders (1965: 114) has suggested that braziers were used for cooking in the Teotihuacán apartment complexes as well as in the houses of outlying settlements.

Six burials were found beneath house floors in the Canal Excavation. This is a rather large number considering that excavations did not normally go below the floors; two were found in stratigraphic pits and the other four in areas where floors had been eroded away. It appears, then, that subfloor burial was a common practice, and that had excavations gone below the floors on a regular basis, a much larger number of burials would have been encountered. All of these were simple pit burials, though pottery grave goods occurred in several.

Fragments of large ceramic tubes were frequently found in the house debris, and it seems likely that they had been used atop the roofs as rain spouts. Other tubes were found protruding through exterior walls and embedded in house floors (Fig. 4(d)), indicating the existence of drainage systems.

The House Groups

The clusters of houses probably represent distinct residential compounds. I refer to these as 'house groups' because while each compound is a distinct unit, its component houses are clearly distinct units as well. This configuration is different from residential compounds such as the Teotihuacán apartment compounds (Millon 1976: 215) which cannot be broken down into a number of independent architectural units corresponding to individual houses.

The Central house group. The Central house group is composed of five houses (IV, V, VI, VIII and IX) grouped around a central courtyard, but only Houses V, VI and VIII front directly on the courtyard. Access to the house group was by means of a narrow entranceway between Houses V and VIII (Fig. 4(h)). House VII, forming the south end of the house group, was not a member, since it was not accessible from the group. It faces eastward towards the temple pyramid, and these two structures appear to form their own subgroup.

The courtyard appears to be a sunken feature, but in reality Houses V, VI and VIII are elevated, while the courtyard is at ground level. This elevation was accom-

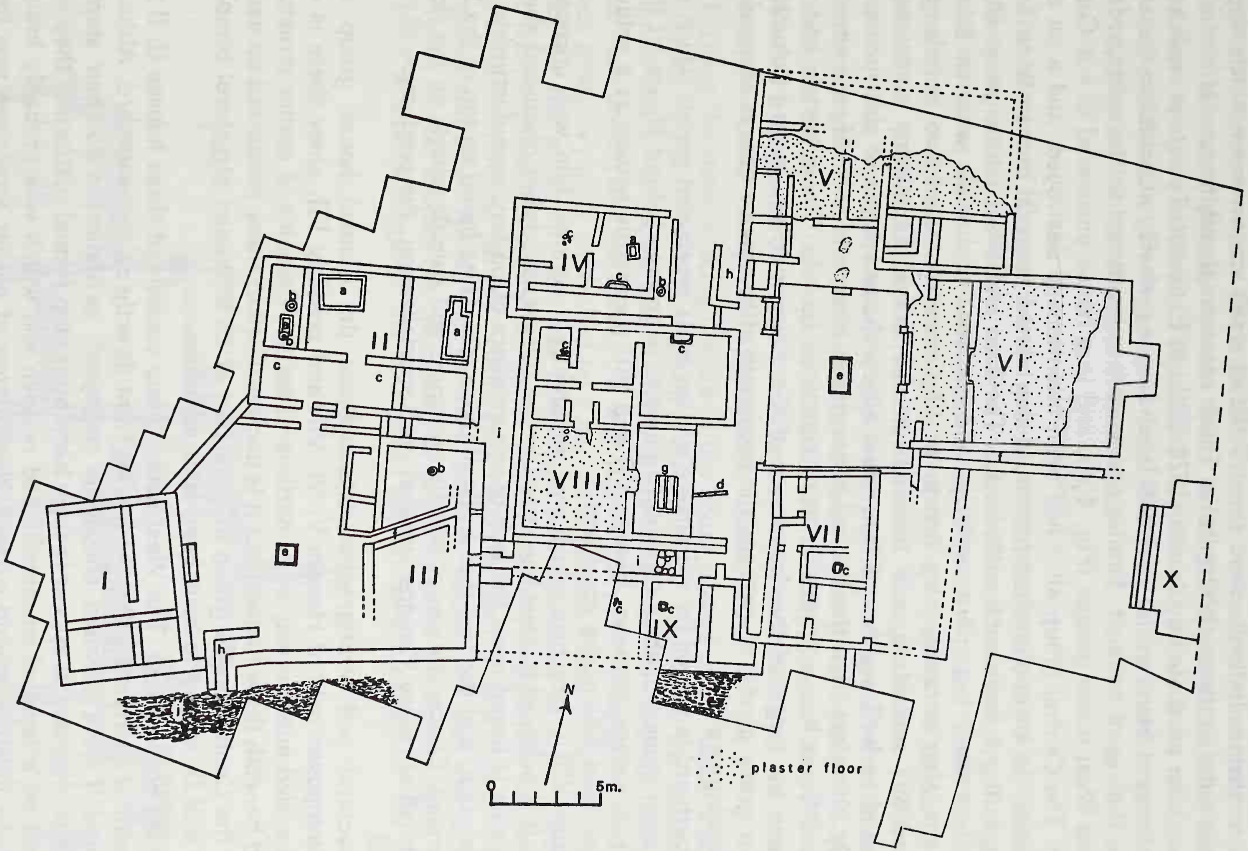

Figure 4. Architectural features of West and Central house groups discussed in text: a. storage pits and boxes; b. subfloor ollas; c. hearths; d. in situ system of ceramic drain tubes; e. altars; f. stone wall drain troughs; g. ceramic kiln; h. entrances to house groups; i. alleyway between West and Central house groups; j. possible street.

plished by building these houses atop low platforms consisting of stone retaining walls surrounding a fill of midden soil. The outer faces of these juxtaposed platforms were faced with small stone veneer to form the walls of the courtyard. The platform edges form a series of walkways connecting the houses to each other and to the courtyard.

In the center of the courtyard is a rectangular structure which apparently served as an altar or shrine. Its walls were constructed of small stone veneer which sloped inward in the *talud* configuration typical of Toltec ceremonial architecture. It is similar in form to an altar excavated by Acosta (1974: 32ff.) at *El Corral*. Ten stone replicas of human skulls were found in the altar debris, and were probably attached to the altar walls, since they were tenoned. Similar altars were encountered in the courtyards of the East and West house groups (Fig. 4(e)), and in a house uncovered in our Corral Excavation. The Central group altar had been intentionally destroyed, and a pit dug into its interior. In an undisturbed portion of the interior, several human teeth were found, suggesting it had contained a burial. The East and West house group altars were also destroyed, but more severely, and evidence of burials was not found. However, the altar excavated by Acosta at *El Corral* contained two burials, one primary and one secondary, and the altar in our Corral Excavation contained a primary burial as well; neither of these two altars showed signs of destruction. It seems likely, therefore, that the Central house group altar, and probably the altars of the East and West house groups as well, contained burials. These burials had apparently been the target of the destruction of the altars, perhaps by pre-Columbian looters after grave goods, or perhaps the occupants of the house groups themselves prior to abandonment.

The courtyard is served by a drainage system in its south-east corner which employed an open stone trough to transport rainwater to an area behind House VI (Fig. 4(f)). The passageway between Houses VII and VIII apparently served as a spillway for the south-west side of the courtyard.

In House VIII a structure which was apparently a ceramic kiln was uncovered (Fig. 4(g)). It is believed to have been used to fire the ceramic tubes discussed above. This conclusion is based upon the lack of any evidence of pottery manufacture in the Canal Excavation, and the fact that a pile of these tubes was found on top of the kiln when excavated. Concentrations of obsidian scrapers and spindle whorls on the floors in the west half of House V suggst another craft specialization, the production of *ixtle* fibre thread.

Architectural and stratigraphic data indicate the Central house group was originally composed only of Houses V, VI, VIII and possibly VII, since there is evidence of a sealed entranceway in its north-west corner. Remains of earlier structures were found beneath these houses, but it is unclear whether these comprised an earlier version of the Central house group or were part of an unrelated structural complex. Houses IV and IX appear to have been later additions.

The West house group. The West house group consists of three houses (I, II and III) and a central courtyard. All three houses front directly on the courtyard. Although Houses I and II were elevated above the courtyard, as indicated by their stepped entranceways, they do not appear to have been built atop formal platforms; they were instead built on a layer of unconsolidated midden soil which was probably brought in to level the existing ground surface. No evidence of earlier structures was found underlying these houses. Both Houses I and III were severely eroded, hence are limited in the information they can provide.

The house group was accessed by a narrow entranceway along the south wall of the house group (Fig. 4(h)). The courtyard altar appears to have been constructed in

the same fashion as the Central house group altar. An open stone wall trough extends from the east side of the courtyard through the middle of House III, where it connects with a system of ceramic tubes which exit through the rear wall of House III into the adjacent alleyway (Fig. 4(f)).

An unusual feature in the West house group is the presence of three large sub-floor pits in the rear rooms of House II. The pit in the north-east room contained a cache of nine exotic pottery vessels. Diehl *et al.* (1974) have identified four of the vessels as Papagayo or Nicoya Polychrome, well-known wares from northern Central America, and the other five vessels as Tohil Plumbate, a ware which appears to have been manufactured in south-western Guatemala.

Discussion

The West and Central house groups, and tentatively the East house group, provide evidence for the existence of a rather uniform kind of residential unit in the Canal Excavation referred to as a house group (Fig. 5). Kubler (1964) has previously recognized the existence of 'house groups' or 'house clusters' as palace and temple complexes in pre-Columbian ceremonial centers, though Millon (1976: 247) has pointed out that it was erroneously applied to partially excavated Teotihuacán apartment compounds. Though not referred to as such, house groups have also been found in residential sectors of Tenochtitlan (Calnek 1972; 1976), Monte Alban (Winter 1974), and Tikal (Haviland 1970). Hence, it is increasingly apparent that the house group was a common and widespread adaptation to urban life.

Perhaps the most striking feature of the house groups in the Canal Excavation is their closed nature. Each house group is closed to the outside by the juxtaposition of its houses and by the occasional use of free-standing walls to close an open side. All houses face inward and are accessible only from within the house group itself. Access to each group is rigidly controlled by a narrow L-shaped entranceway which provides privacy for the occupants and has clear defensive potentials as well. Paradoxically, while such a closed configuration would impede regular interaction between households of different house groups, within each house group it would appear that regular interaction and collective activity between member households was encouraged. The occurrence in and around the courtyards of grinding slabs (*metates*), ollas, and other utilitarian artefacts suggests the courtyards served as extensions of the houses by

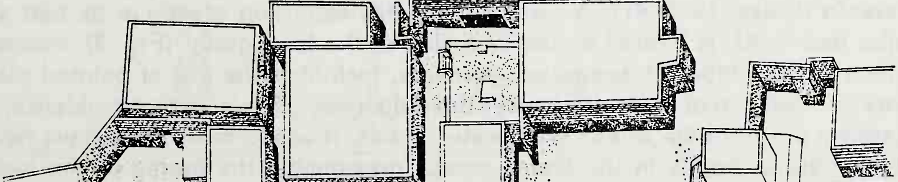

Figure 5. Hypothetical reconstruction of house groups in Canal Excavation.

providing additional space for household members to perform domestic activities in the company of others. The centrally-located altars suggest the courtyards were also the sites of collective ritual activities. The house group would seem to provide the occupants of each house a measure of privacy, while the layout of houses around a central courtyard would have placed all of the households in regular and intimate daily contact.

This raises the possibility that each house group was a kin unit consisting of a series of related households, and I believe they were. Recalling that at least one and possibly all three of the courtyard altars had contained burials, it would appear that ritual activities associated with the altars involved veneration of an ancestor. At the very least, the burial of a person in such a central and prominent place suggests there were bonds between that person and the occupants of the group, presumably a bond of kinship. Hence, while burials beneath the houses were probably relatives of the households, the altar burials may have been heads of the entire kindred.

A unique aspect of the house groups in the Canal Excavation at Tollán becomes apparent when they are compared to residential house groups at the pre-Columbian cities of Tenochtitlan (Calnek (1972; 1976), Monte Alban (Winter 1974), and Tikal (Haviland 1970). Available evidence indicates the houses in the house groups at these sites were generally smaller than those of Tollán, and usually contained only one or two interior rooms. By comparison, six of the nine houses in the West and Central house groups contained four or more rooms; Houses V and VIII each contained eight or more (Table 1). Considering the large number of rooms and relatively large size of many of the houses, it would appear that these were multiple family dwellings. This is supported by the existence of two distinct hearth areas in four of the houses (Fig. 4(c); Table 1). The possible existence of multiple families in these houses might be further investigated by looking for duplication of activity areas reflected in the distribution of artefacts recovered from the floors. At present I am postulating that Houses IV, VIII, IX and possibly II were multiple family dwellings by virtue of their multiple hearth areas. I am also considering House V as a multiple family dwelling by virtue of its large size, large number of rooms, and its 'duplex'-like configuration. If the entire house group was a corporate kin-based unit, the families within one house would probably comprise a subunit within the kindred.

The considerable variation in overall architectural quality of the individual houses may be an indicator of relative status differences of their occupants. This is particularly apparent in the Central house group, where three general levels of architectural quality are seen. House VI is by far the most elegant structure of the Central group, perhaps of the entire Canal Excavation. Its wide stepped entranceway, porch and spacious rear room is almost identical in form to temple structures at Teotihuacán (Millon 1967: 47). A curious niche-like extension is seen in its rear wall. A similar house, XI, is located on the east side of the East group (Fig. 3). House VI contains a large number of decorative elements, including the use of painted plaster on floors and walls, roof trim, and a post-lined doorway. If this were a residence, and the presence of utilitarian artefacts indicates it was, it would most likely have housed the highest status family in the house group, presumably the family of the highest ranking member of the kindred. It is interesting to note that House VI has a wide plastered stepway which leads directly to the courtyard altar.

Houses V and VIII are less architecturally sophisticated structures, but both are large structures with some plaster floors and walls, roof trim, and decorative facing. Both houses show evidence of occupational specialization, as noted above, and presumably would have housed families of intermediate status who were involved in

specialized economic activities. Both of these houses, like House VI, enjoy direct access to the courtyard.

The lowest level of architectural quality in the Central house group is exhibited by Houses IV and IX. Both are small structures with dirt floors and some mud interior walls. Considering their small size, the two families that apparently occupied each house would have enjoyed considerably less privacy than those of the larger houses. Neither house enjoys direct access to the courtyard, and House IV is completely outside the house group confines. Both appear to have been later additions to the group, which may explain the postulated low status of the resident families.

Nutini's (1968) ethnographic study of an industrial town in Tlaxcala provides evidence of this kind of residential pattern in existence today. He notes the presence of extended family households (*solares*) consisting of a number of houses grouped around a courtyard. Each house was occupied by one or more nuclear families. Within this extended family unit a hierarchy existed based upon age. Rank within the hierarchy was strongly associated with quality of living quarters, and one of the functions of the extended family head was the proper distribution of living quarters according to rank.

Some idea of the population of these house groups might be gained from using existing formulae for population estimation based on dwelling size (Naroll 1962; Casselberry 1974). Casselberry's formula is perhaps most appropriate, since it is based on multiple family dwellings: one-sixth the floor area of the dwelling as measured in square meters. Applied to the Canal Excavation (Table 1), the fully exposed West and Central House groups would have contained about twenty-nine and sixty persons respectively.

There are a number of valid criticisms of the use of such formulae (*e.g.*

Table 1. Summary of architectural data pertaining to household composition of West and Central house groups.

House no.	Area (m^2)[1]	No. of interior rooms	No. of identifiable hearths	Estimated no. of families
I	53.6	4	0	1
II	74.1	5	2	1-2
III	45.8	1-2	0	1
IV	40.9	4	2	2
V	110.3	9+[2]	0	2
VI	77.0	2	0	1
VII [3]	37.5	5	1	1
VIII	95.0	8	2	2
IX	38.5	2+[2]	2	2

[1]Calculated on outside dimensions of houses.
[2]Based on incomplete evidence.
[3]Not actually a member of Central house group, but may once have been. Excluded from population estimates.

Casselberry 1954; LeBlanc 1971; Weissner 1974), and I urge caution in accepting these estimates for the following reasons: First, dwelling area does not technically include the open courtyards, but these apparently were sites of regular domestic activity. Second, the multiple family dwellings in Casselberry's sample did not have interior rooms, so that in applying it here one must choose between including the interior walls in area estimates or excluding them. Third, Casselberry has aptly pointed out that such formulations do not consider cultural variation in human proxemic systems. In the Central house groups, for example, the amount of dwelling space per person would appear to be a function of collective status. Hence, we have, paradoxically, the large, spacious House VI, which probably housed a single family, and the small, crowded multifamily Houses IV and IX. I avoid using floor area formulations to estimate population for individual houses, but one might hope that for an entire house group errors of over- and underestimation might cancel each other out. Realistically, a more appropriate estimation would be one based on the number of identifiable family units rather than floor area, which may be possible once artefact analysis is complete.

The architectural use of intervening space may give some indication of the nature of relationships between the groups. There exists a system of passageways in and around the West and Central house groups which could have served as alleyways connecting the two house groups (Fig. 4(i)). When discovered, all of the passageways were blocked off by stone and adobe barriers and piles of boulders. All of these barriers were architecturally intrusive, hence, most likely later additions. With the barriers removed (Fig. 5), a well-defined passageway system connecting the two house groups is seen, with the courtyards serving as terminals of traffic. Hence, the West and Central house groups, while accessible to outsiders only by narrow entranceways, were readily accessible to each other via this system of alleyways. This was most likely a private alleyway rather than a public street. Evidence of what might have been a public street was found along the extreme south border of the Canal Excavation immediately outside of the house groups, where a 'pavement' of tabular stones turned on their sides was found extending from the entranceway of the West group to the east edge of House IX (Fig. 4(j)).

The ease of accessibility between the two house groups may imply they housed related kin units. Perhaps the West group was built to accommodate further growth of the kindred occupying the Central house group. This cannot presently be answered, but further stratigraphic analysis aided by absolute dating may provide a clearer picture of the relative ages of the two house groups.

There is no direct connection between the Central and East house groups, since the two are not juxtaposed as are the Central and West house groups. The presence of the temple pyramid may mean that the East house group occupants were of a different social status. Hopefully, more can be said about this when the East house group is analyzed.

There is some architectural evidence that the house groups in the Canal Excavation may have been part of a larger territorial grouping on the order of the Aztec *calpulli* or the *barrio* groupings Millon (1973: 40) has discovered at Teotihuacán. All of the structures uncovered in the Canal Excavation had the same approximately 18 degrees west of magnetic north orientation; even the earlier structures found beneath the Central house group were oriented in this direction. This orientation is different from the slightly east of magnetic north orientation of *El Corral* and the structures in our Corral Excavations. Furthermore, both of these orientations differ from the 17 degrees east of true north orientation of the acropolis (Aveni and Gibbs 1976: 512). It

is clear that Tollán lacked a common overall orientation. This does not necessarily mean that no pattern of orientation existed; our excavations suggest instead that a number of localized orientations were followed. The common orientation of all the structures in the Canal Excavation indicates that on a local level some overall policy of orientation was adhered to, and its occurrence in earlier structures indicates the policy had temporal continuity. Hence, differences in orientation of structures may mark the boundaries of corporate 'neighborhood' groupings in existence at Tollán.

Conclusions

The house groups excavated at Tollán were residential compounds housing a number of families which possibly formed some type of kindred. There is ample evidence of domestic activities, but there is also evidence of economic specialization in the Central house group involving the production of ceramic drain tubes and *ixtle* fiber thread. It does not appear that all of the households were engaged in the same activity, since evidence of both of these specializations occurred in the same house group, and in only two houses of that group.

The presence of several large, well-built houses and the presence of what probably represent luxury items, such as the exotic trade vessels in House II, indicate some of the occupants were of relatively high status. But again it does not appear that all of the households of a single group were of this status. The considerable variation in size and overall architectural quality of dwellings within a single house group suggest differences in status of households, perhaps in a hierarchical pattern of descent.

The residential compound appears to be a common residential pattern in pre-Columbian cities, reflecting its successful mode of adaptation to urban life. Its advantages obviously lie in its ability to organize supra-family groupings into close-knit, semiautonomous groups for whatever purpose this was intended. As a form of residential compound, the house group would appear to have a number of desirable qualities, such as its ability to offer its occupants greater privacy by the use of individual houses. It possesses a flexibility which is apparent in several ways. Its architectural flexibility allows for the expression, and hence reinforcement, of status differences between member households. Its flexibility is also apparent in its capacity for expansion. Citing earlier observations of Kubler (1964) on the 'open corner' courtyard design, Robertson (n.d.) notes that such a design allows for expansion by providing sites for the construction of subordinate units. This is precisely what has occurred in the Central house group, where Houses IV and IX were erected in the open corners on the north-west and south-west sides of the courtyard. This would represent a form of 'planned accretion,'' since these sites would have existed from the beginning.

The Central house group occupies a square space measuring about 30 m on each side, with the courtyard altar in its center (Fig. 3). The sharp boundaries of this unit can be clearly seen on the east side by an imaginary line between the outer niche wall of House VI and the temple pyramid steps. This 30-m block may represent a plot of land designated to the Central house group.

The West house group is somewhat different from the 'block' pattern of the Central house group, but close inspection will show that it is House I which deviates from the pattern. The West house group could easily attain this pattern by adding structures on its north-west and south sides.

This capacity to expand is not infinite, however, since there are a limited number of open spaces, and each house group would be competing with other expanding house groups. In the Central house group, for example, the temple complex has ap-

parently expanded into its south-east corner. Once available space is filled, the only recourse would be a process of architectural involution, where existing houses are partitioned to accommodate more families. A number of the interior walls of House V appear to have been later partitions, perhaps for this purpose, and Houses IV and IX, despite their small size, are multiple family dwellings probably because they were unable to provide new space for their expanding households.

Another problem faced by such large corporate residential units, particularly those involving kindreds, would be the tendency for fission to occur within the social unit. There is perhaps some architectural evidence of this in the Canal Excavation: the construction of a barrier across the north-west corner of the walkway around the Central house group courtyard; the closing off of House VII from the Central house group; and the closing of the alleyway between the West and Central house groups by erecting barriers. These features raise tantalizing questions about changing relationships within and between the house groups which cannot be easily answered.

The house group is but one form of residence in ancient Tollán. Residential structures excavated near the acropolis (Charnay 1887) and in our Corral Excavation apear to represent portions of apartment complexes similar to those of Teotihuacán. These appear to have been elite residences, by virtue of their architecture and proximity to ceremonial structures, so that it is possible the house group was the common type of residence of the general Toltec populace. This can only be confirmed by more extensive investigation of other residential sectors of the ancient city.

—1977

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25

The Internal Structure of Tenochtitlan[1]

by Edward E. Calnek

According to the traditional Aztec histories, Tenochtitlan was founded on a small island near the western shore of Lake Texcoco in the Basin of Mexico in A.D. 1325.[2] After achieving political independence for the first time in about 1427, it commenced a vigorous career of military expansion that continued until the Spanish invasion in 1519. The entire process of its urban development, therefore, spanned slightly less than two centuries. At the end of this period Tenochtitlan was unquestionably the largest and most highly urbanized city in the New World. It was also the political center of an empire that extended from the Gulf Coast to the Pacific, and southward, at some points, to the modern frontier between Mexico and Guatemala.

The internal political history of the Aztec state is complicated by the existence of a second settlement, Tlatelolco, founded by a dissident faction on another island a short distance to the north in A.D. 1337. Since Tlatelolco was conquered and annexed by its more powerful sister-city in 1473, it is discussed here as though it were a simple subdivision of Tenochtitlan. Certain anomalies resulting from this division are discussed below. It should be kept in mind, nonetheless, that there were important differences in the growth patterns of each city. Commerce played a key role in the early development of Tlatelolco, while other types of occupational specialization may have been more highly elaborated in Tenochtitlan. A detailed examination of similarities and differences would, however, carry us far beyond the scope of this chapter.[3]

Reliable quantitative evidence relating to urban growth rates is not available. The historical sources suggest moderate but continuous increases in Tenochtitlan's urban population throughout the preimperial period—in part stimulated by state initiatives

designed to induce outsiders to settle and marry within the city (Durán, 1951, vol. I:60-61). When Chimalpopoca assumed the throne in 1415, the city had begun to take on a more conventionally urban aspect, as the surrounding marshlands were converted to residential space, and well-built houses of stone and adobe replaced the *chozas* (huts) of earlier times (Durán 1951, vol. I:62). The wealth and prestige that resulted from even the early military successes during the Imperial period evidently began to attract immigrants in significantly larger numbers. During the reign of Motecuhzoma Ilhuicamina (1440-67), vigorous state intervention was required to suppress internal disorders and to reorganize a population that included numerous foreigners, as well as descendants of the city's founders (Durán 1951, vol. I:213-14). By 1519 the area of more or less continuous urban habitation can be estimated at between 12 and 15 square kilometers, and the total population as in the vicinity of 150,000 to 200,000 inhabitants (Calnek 1970, 1972a).

Information summarized elsewhere (Calnek 1972b) suggests that the transition from an essentially rural to a highly urbanized economic base was achieved after A.D. 1385, and that it was closely linked to rapid demographic growth—achieved in large part by absorbing immigrants into the urban labor force. At the present time, it is not possible to determine whether the still higher growth rates sustained during the Imperialist period (following 1427) occurred in spurts or whether they were more or less continuous up to the time of the Spanish Conquest. Whatever the answers to these and related questions, it is clear that Tenochtitlan's population multiplied several times over during the two centuries of its existence, and that population growth was associated with a series of important changes in the city's internal structure over time.

Before attempting to describe Tenochtitlan's internal organization at the time of the Conquest, it is useful to consider several characteristics of population growth that have not been sufficiently emphasized by previous investigators. The existence of a large immigrant population from comparatively early times has already been noted. This included organized craft groups such as the lapidaries, who originated in Xochimilco but retained important ritual links to their homeland even though they appear to have been wholly absorbed into the politico-administrative system of the host city (Sahagún 1950-69, Bk. 9:80, Torquemada 1723, vol. II:60). Acosta Saignés (1945:39-41) suggests that the *pochteca* (merchants) were linked ethnically to populations residing near the Gulf Coast, while Sahagún's informants date their appearance to the reign of Cuacuauhpitzauac of Tlatelolco—that is, the late fourteenth or early fifteenth century (1950-69, Bk. 9:1). The manuscript painters (*tlacuiloque*) were probably descendants of the Tlailotlaca, a Mixtecan group that arrived in the Basin of Mexico in the fourteenth century and then dispersed to centers where their particular skills were needed and wanted (Robertson 1959:13, 138-39.

Other sources of immigration included war refugees. A large group from Huexotzinco, for example, settled temporarily in Tenochtitlan when their homeland was devastated by the Tlaxcallans (they returned when peace was restored between the two former allies) (Durán 1951, vol. I: 476-77, Tezozomoc 1944:460-70). The Cuauhquecholteca—also victims of Tlaxcallan attacks—remained in the city, where many of them owned houses near the great market of Tlatelolco (Sahagún 1950-69, Bk. 12:103). Population movements of this type were by no means unusual, nor was Tenochtitlan-Tlatelolco the sole beneficiary of political disruptions in other city-states. The Aztecs themselves, for example, had dispersed widely after a military defeat at Chapultepec in the late thirteenth century. A large group of refugees settled at Colhuacan, where they immediately began to intermarry and mingle with the local

population (García Icazbalceta 1941:225-26, Durán 1951, vol. I:33, Torquemada 1723, vol. I:91). Of these refugees a good many apparently remained in Colhuacan, even after the founding of Tenochtitlan, since several barrios calling themselves Mexica later moved from Colhuacan to Texcoco (Ixtlilxochitl 1952, vol. I:295, vol. II:74).

When Colhuacan was totally abandoned in the late fourteenth century, a part of its population settled in one of the southeastern districts of Tenochtitlan (García Icazbalceta 1941:228). Others, as noted above, went to Texcoco, to Cuauhtitlan (Velázquez 1945:29 ff), and doubtless to many other localities. On the eve of their great rebellion against Azcapotzalco in 1426 or 1427, the Aztecs are said to have seriously considered moving en masse to that city, where their presence would scarcely be noted because of its great size—or so the Tenochcan leaders thought (Durán 1951, vol. I:70, Tezozomoc 1944:27).

From these and similar references, it is clear that the city-states that began to emerge during the thirteenth and fourteenth centuries were heterogeneous with respect to ethnic composition and highly unstable insofar as political loyalties were concerned. Colhuacan played a key role in defeating the Aztecs at Chapultepec, for example, but within a few years, Aztec warriors were fighting side-by-side with their former enemies against the armies of Xochimilco (Dibble 1963:31 ff.). Too, there is no indication that Mexica barrios in Texcoco retained sentiments of political solidarity with their cousins in Tenochtitlan. All in all, then, the case with which political loyalties could be manipulated and transferred is a background factor of major importance in explaining the rapidity with which individual city-states grew and declined throughout the chaotic era that preceded Tenochtitlan's rise as an imperial power.

It must be remembered, however, that this was also a period characterized by generally rising populations and the gradual intensification of land use throughout the Basin of Mexico. As long as cultivable land was available, it was relatively easy to move large groups from one place to another. But by the mid-fifteenth century, this was no longer the case, and we observe instead the opposite process—the recolonization of temporarily abandoned regions and the construction of relatively large-scale hydraulic systems designed to improve agricultural productivity (Palerm 1955, Armillas 1971, Calnek 1972b).* The situation at Tenochtitlan-Tlatelolco differed from that elsewhere mainly in the degree to which the labor force consisted of full-time occupational specialists rather than peasant farmers. Since the ability to absorb immigrants depended on the availability of jobs rather than land, it is not surprising that Tenochtitlan had outstripped even its most powerful rivals (for example, Texcoco) by the end of the fifteenth century.

Viewed from this standpoint, Tenochtitlan and Tlatelolco may already have been more *cosmopolitan* in structure and outlook than any of their neighbors at the beginning of the Imperial Period. The emphasis on trade and craft production required the development of political strategies aimed at securing markets and sources of raw material, for example, rather than the planning and execution of large-scale irrigation systems, as was the case at Texcoco (Palerm and Wolf 1954-55).[4]

The cosmopolitan quality of urban life was further enhanced by the presence of literally thousands of visitors who came to buy and sell in the market (Conquistador Anónimo 1941:43, Cortés 1963:72), to deliver tributes, and to perform labor services, as well as for a great variety of other purposes. In some cases large groups had to be accommodated for periods of days or even weeks. Visiting dignitaries received the

*The papers by Drs. Palerm and Armillas cited here are reprinted in the present collection of readings.—*J.A.G.*

hospitality of the royal court, where they were supported with revenues provided by the king's personal estates (Carrasco 1967:149, Durán 1951, vol. I:101). The rulers of many subject states, along with their personal retinues, were required to spend a part of each year at the imperial court, and at least some of these rulers maintained personal residences in Tenochtitlan (Cortés 1963:75, Díaz del Castillo 1960:176, Gómara 1943, vol. I:228) The pueblo of Cuitlatenamic either owned a house in Tenochtitlan or maintained a permanent relationship with an Aztec household where its men stayed when they brought tributes or had other business there (AGN Tierras, vol. 34, exp. 4, fols. 2, 32, 82). Casual visitors could purchase cooked foods at the urban markets and stay overnight in hostels scattered throughout the city (Díaz del Castillo 1960:159, Anglerius 1912, vol. II:109).

There is, in short, substantial evidence for fluidity and movement between cities and other localities in the Basin, ranging from permanent immigration to brief visits. Although the internal organization of cities is necessarily based on the permanent resident population, it is evident that Tenochtitlan, from comparatively early times, had developed sufficient internal flexibility not only to integrate a heavy flow of outsiders who intended to remain, but also to accommodate the large transient populations that had become a virtually permanent feature of urban life.

These related points require a more detailed examination than can be attempted in this chapter. They are emphasized here only to suggest aspects of the quality and complexity of urban life at Tenochtitlan which do not emerge with any clarity from analytic studies of groups defined in terms of territory, kinship, occupation, and other types of relatively permanent affiliation.

In the remainder of this chapter, I will attempt to define the principal types of permanent social groupings that can be identified from descriptions of the city as it existed at the time of the Conquest, and that can also be linked to potentially identifiable architectural markers. This is, of course, only one of a variety of procedures that might be adopted to organize data relating to Tenochtitlan's social organization. It is adopted here with the intent of clarifying the relationship between social structure and settlement pattern, thereby facilitating comparisons between the Aztec capital and other early cities, such as Teotihuacán, for which there is little or no direct historical evidence.

The most serious difficulty resulting from this procedure is that good physical descriptions are available for only a small number of the more monumental types of public buildings and, because they were the subject of frequent lawsuits in the Colonial Period, a few of the simpler types of domestic architecture (Calnek 1972a). It is frequently possible to link groups or activities to definitely named structures mentioned in the chronicles, but we lack sufficiently precise information to permit definitive identifications, even if an example were to be encountered in archaeological context. At the present time, archaeological evidence relating to urban settlement pattern and architecture is extremely limited.[5] The justification for this obviously imprecise procedure is, quite simply, that there appears to be no other workable alternative, if our objective is to begin a comparative study of ancient Mesoamerican cities.

It is convenient to begin by examining the principal territorial divisions of the city (Fig. 1), because they can be described with considerable precision on the basis of written documents and colonial period maps. The largest unit—the city (*hueialtepetl*) —originally consisted of two autonomous states: Tenochtitlan and Tlatelolco. Both were founded at about the same time, and both were closely linked by geographic proximity, a common history before their foundation, and a strong sense of cultural and ethnic identity. Both groups regarded themselves as Mexica, maintaining an

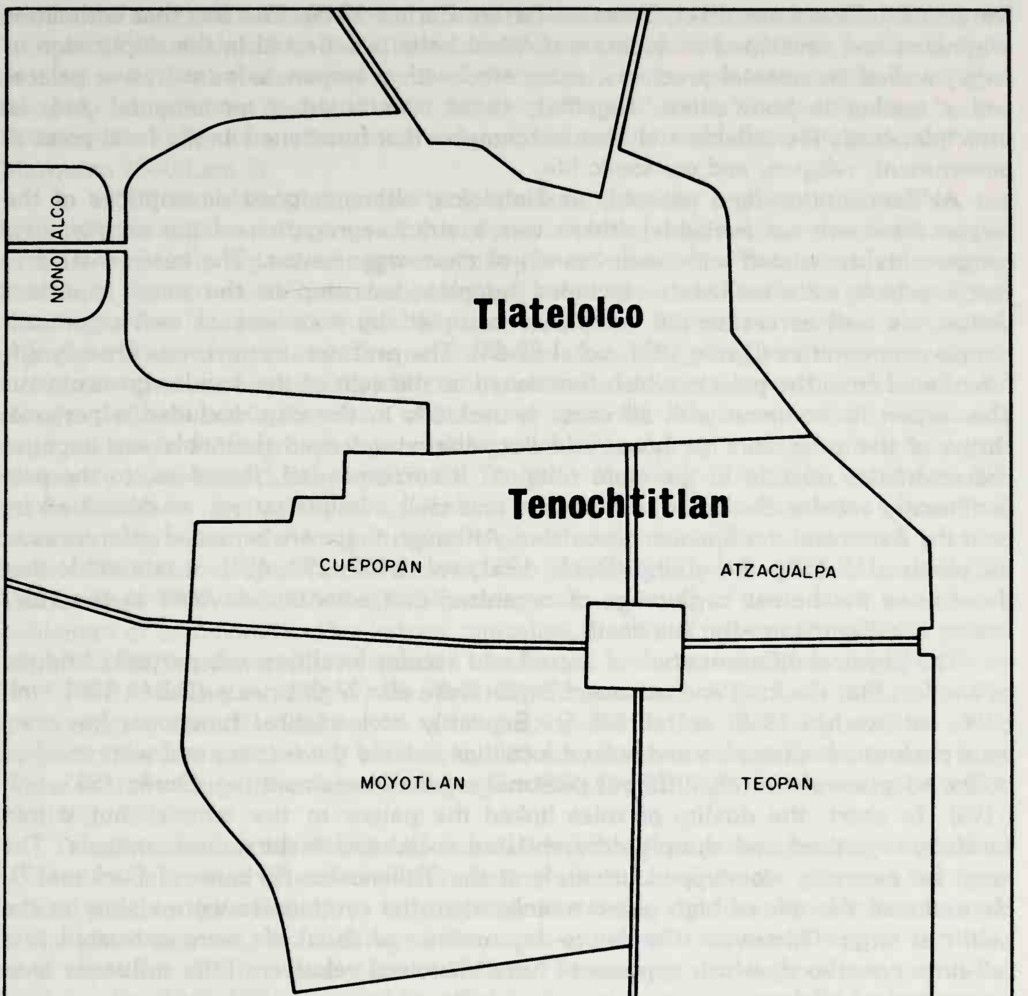

Figure 1. Map showing the relative locations of Tenochtitlan and Tlatelolco and the four Great Quarters of Tenochtitlan.

exceptionally close ceremonial and economic relationship both before and after the annexation of Tlatelolco by its more powerful sister-city in 1473 (see, for example, Durán 1951, Tezozomoc 1944, Toscano, Berlin, Barlow 1948). The fact that both cities originated and developed as separate political units is reflected in the duplication of large, walled ceremonial precincts, associated with a *tecpan* (administrative palace) and a market in both cities. Together, these constituted a monumental and, in principle, easily identifiable architectural complex that functioned as the focal point of government, religion, and economic life.

At Tenochtitlan (and probably at Tlatelolco, although good descriptions of the *tecpan* there are not available), there was a strict segregation of the architectural components associated with each branch of civic organization. The ceremonial precincts, which were walled in, included temples dedicated to the most important deities, as well as residential complexes occupied by members of well-organized, temple communities (Durán 1951, vol. I:82-83). The precinct, in turn, was sharply differentiated from the palace, which functioned as the seat of the secular government. The *tecpan*, in common with all other households in the city, included a personal shrine of the ruler and his household but otherwise lacked definable architectural characteristics relating to the state religion. It corresponded, therefore, to the predominantly secular character of kingship and civil administration, as described by both the Aztec and the Spanish chronicles. Although there are repeated references to the personal divinity of the king (Durán 1951, vol. I:162, 292, 421), it is notable that there were the barest beginnings of organized cult activities devoted to the ruler during his lifetime or after his death.

The physical differentiation of sacred and secular localities was partially bridged by the fact that the king and other noblemen were also high priests (Durán 1951, vol. I:196; Ixtlilxochitl 1952, vol. II:305-6). Explicitly ecclesiastical functions, however, were performed at temples and sacred localities outside the *tecpan*, and were marked by the adoption of entirely different personal regalia in each setting (Durán 1951, vol. I:196). In short, the duality of roles linked the palace to the temple, but within carefully organized and sharply differentiated social and architectural contexts. The king, for example, worshipped privately at the Tlillancalco ("House of Darkness"). He assumed the role of high priest mainly when the ceremonies were visible to the public at large. Otherwise, the day-to-day routines of ritual life were entrusted to a full-time priesthood, which appears to have exercised relatively little influence over governmental affairs.

The generally greater importance of governmental officials, who were titled noblemen of the highest rank, is most effectively demonstrated by Durán (1951, vol. II:124-25), who observes that men who had already demonstrated their probity, personal worth, and piety within the priesthood could be promoted to offices of great honor and authority within the state ("los sacauan a dignidades y cargos honrrossos en las republicas"). The ceremonial precinct, therefore, was symbolically identified with the city and the state. Nonethelsss, it was clearly subordinate to the palace insofar as the distribution of political and even ecclesiastical authority was concerned.

This type of organization is evidently reflected in the greater architectural prominence and independence of the *tecpan* with respect to the sacred precinct, and possibly in the closed-in character of the latter, as compared with Teotihuacán. Large, complex, and even luxurious residential quarters adjoin religious structures at Teotihuacán, but they are clearly subordinated to an architectural design that emphasizes the temple pyramids of the "Street of the Dead" as the dominant component. No palace thus far identified at Teotihuacán approaches the size and inde-

pendence of Motecuhzoma's palace, as described by such early chroniclers at Cortés (1963:77-79). This structure occupied an area of about 2.4 hectares—approximately double the combined areas of three closely related residential complexes adjoining the Temple of Quetzalcoatl in the Ciudadela at Teotihuacán (R. Millon, personal communication). The secular component of the urban center also included large palaces formerly occupied by Axayacatl, the father of Motecuhzoma Xocoyotzin, and by the Cihuacoatl—a dignitary whose rank was second only to that of the king himself (see Marquina 1960:Lam.2).

In addition, while the great temples occupied the highest rank within the inventory of religious structures of the city as a whole, they did not stand at the apex of a hierarchically organized system of temple communities. The individual temples located in the ceremonial precinct outranked those associated with the great quarters and the barrios (see below), but in this case rank order did not correspond to a rigidly organized chain of command. The palace occupied by a reigning monarch, in contrast, included numerous functionally differentiated halls and patios—each concerned with clearly defined administrative, military, or judicial functions, which ultimately engaged much wider groups by the delegation of authority through officials of progressively lower rank (Sahagún 1950-69, Bk. 8:41-45, Durán 1951, vol. II:161-66). The barrio headmen, for example, assembled each day at the *calpixcalli*, where they awaited orders from the king or other high officials, and then transmitted them to lower officials who supervised their execution (Durán 1951, vol. I:323-24, vol. II:165, Torquemada 1723, vol. II:544-45). Separate courts existed to hear cases brought by noblemen or commoners. The judges controlled a staff of lower officials who maintained order, made arrests, recorded decisions, and carried them out (Motolinía 1903:303-12, Sahagún 1950-69, Bk. 8:41-42, Torquemada 1723, vol. II:351-53). The great military councils deliberated at the palace: thereafter, the army was mobilized by great quarters and then by barrios, by officers whose rank was linked to each level of the military chain of command (Sahagún 1950-69, Bk. 8:51, Tezozomoc 1944:273, 284, 403, 437).

Tenochtitlan (but not Tlatelolco) was divided into four great quarters, marked off by four avenues that extended in the cardinal directions from the gates of the ceremonial precinct (see Fig. 1). A large temple or temple complex was located in each of the great quarters, but nothing whatever is known of their actual size or architectural character (Códice Franciscano 1941:6). Tezozomoc mentions structures called *huehuecallis* (1944:399), occupied by officials described as the absolute lords (*senores absolutes*) or chiefs (*caudilles*) of the quarters (1944:284, 315-16, 399-400, 437). The *huehuecallis* may have adjoined the temples and plazas associated with the great quarters to replicate, on a smaller scale, the pattern already described for the urban center.

In late pre-Hispanic and early colonial texts, the great quarters were subdivided into barrios called *tlaxillacallis*. The *tlaxillacallis* bore the same names as were employed to identify units called calpullis. An examination of the contexts in which each term occurs in the Sahagún texts suggests that *calpulli* referred to a certain kind of corporate, localized social group, while *tlaxillacalli* was most frequently employed as a locational reference.[6] It would appear, consequently, that individuals were members of a named calpulli, but they resided in a *tlaxillacalli* or barrio bearing the same name. Although it is impossible to summarize the full range of documentary source materials regarding this question, it is likely that calpulli membership was closely related to occupation and to personal membership in certain types of ritual groups (Monzon 1949:47-51).

The territorial framework provided by the *tlaxillacalli* may have been exploited as a primary component for the internal administrative organization of the Aztec state. That the two types of affiliation did not result in entirely coterminous social groups is at least suggested by Durán's reference to the possibility that marriages could occur between members of different barrios (1951, vol. II:228-29), and as well as by the occurrence of several cases of uxorilocal residence in early colonial archival texts. Thus, according to our literature, a certain *platero* (goldsmith or silversmith), who resided with his wife's family in the barrio named Zacatlan in the great quarter of Atzacualpa, acknowledged the authority of the lords (*principales*) of the *plateros'* guild (which was centered in the barrio of Yopico in Moyotlan) up to the time of his death in 1543. He himself employed an apprentice from Copolco in Cuepopan, who appears as a craftsman in his own right at a later date (AGN Tierras, vol. 30, exp. 1, fols. 14-16, 64). Although little more than two decades had elapsed since the Conquest, there is no indication that this arrangement was considered unusual.

The barrios—conceived as territorial units—were marked by a structure that housed the patron deities of the group (Duran 1951, vol. II:148, Sahagún 1950-69, Bk. 2:16, 39). This structure was evidently a part of a larger complex that also included a *telpochcalli* (young men's house) (Sahagún 1950-69, Bk. 3:58, Durán 1951, vol. I:216-17), and in most or all cases, a plaza or market (Cortés 1963:72, Gómara 1943, vol. I: 236). The architectural characteristics of these units cannot be adequately defined at present, but they should have formed a distinctive type of complex, which could be easily distinguished from those marking the great quarters and the city in overall scale. The calpulli temple, as illustrated by Sahagún (1950-69, Bk. 2:Fig. 51), does not seem to have been a large pyramid-temple, but is shown as an almost houselike structure, constructed over a low, stepped platform; it was within a small, walled enclosure that included other buildings as well. In addition to providing the locus for public and private rituals dedicated to local deities, the temple was also the meeting place for barrio elders and the focal point for large ceremonials organized by occupationally specialized groups (see Sahagún 1950-69, Bks. 2, 3, 9). It provided, in short, a kind of civic center in relation to which the social identities of the greater part of the urban population were most immediately expressed, and, additionally, where a great variety of activities essential to the urban neighborhoods were conducted.

Although each barrio was divided into groups of houses or households for administrative purposes (Durán 1951, vol. I:323-24), there are no references to distinctive architectural features occupying an intermediate position between the calpulli center and the individual residential sites. Domestic architecture represents an entirely distinct level of organization, directly below the *tlaxillacalli*. In this chapter I will merely sketch out a few of domestic architecture's salient characteristics and their relation to the internal organization of household groups—primarily because of the great importance of these data for comparison with, and interpretation of, settlement patterns at Teotihuacán and other earlier cities. Fortunately, there is a good deal of detailed archival evidence relating to residential sites and to household organization, including genealogies and census data that, in some cases, can be followed over periods ranging up to five or six generations—that is, over time periods long enough to yield important insights into developmental cycles at the level of the elementary household or domestic group.

A number of typical residential sites at Tenochtitlan have been illustrated in Figure 2. All have been drawn to the same scale from early ground plans or written descriptions that include the dimensions of basic site components. Residential sites characteristically took the form of walled compounds that enclosed a number of

separately entered dwelling units and faced inward on an open patio space. Each compound was normally occupied by a bilateral joint family—most frequently, a group consisting of an elderly couple, their married children (including daughters, although virilocal residence was most common), and grandchildren, or some derivative unit at later stages in the normal cycle of family development. Each married couple occupied a single one- or two-room dwelling or, in some cases, a single floor within a two-story

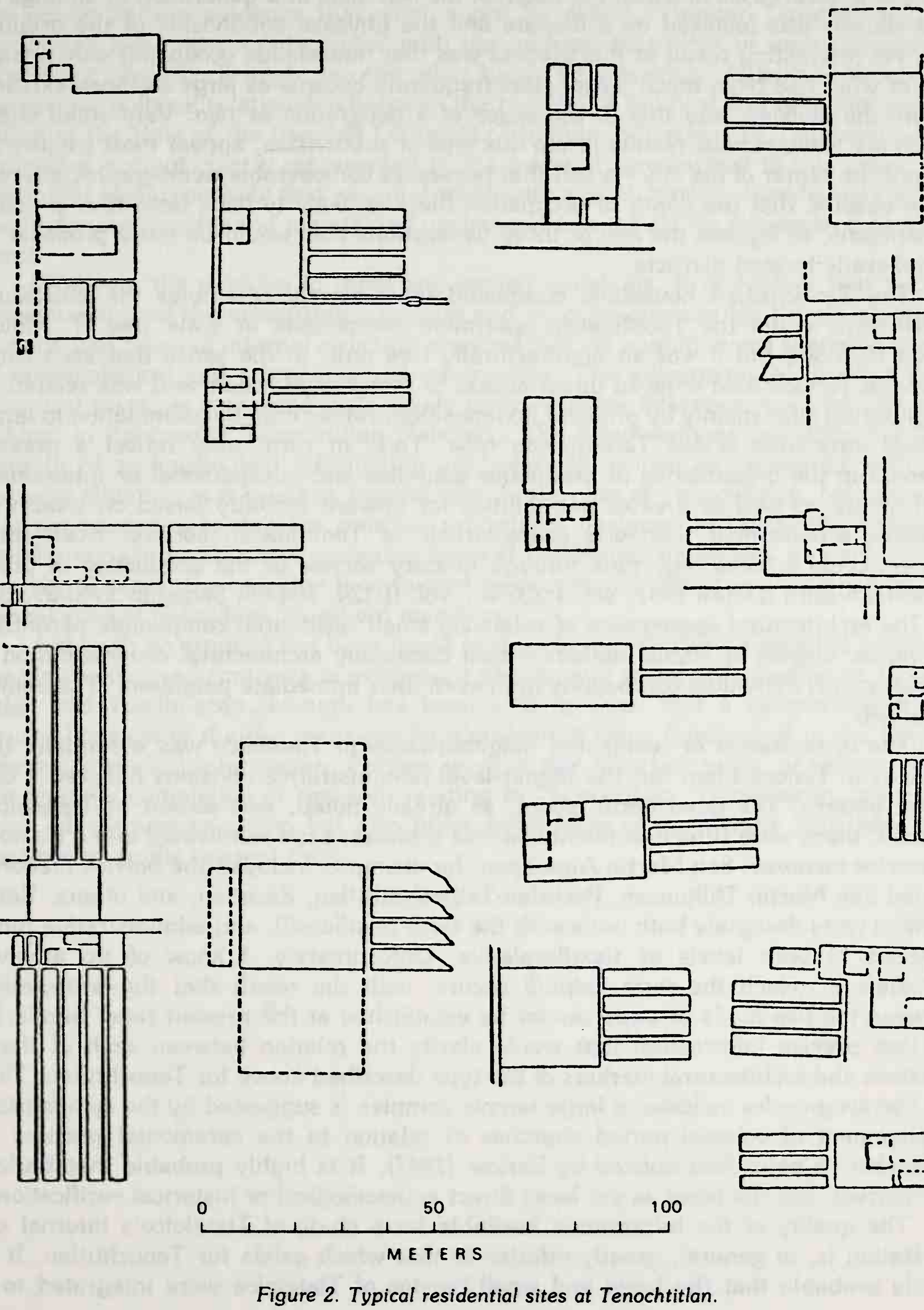

Figure 2. Typical residential sites at Tenochtitlan.

house. If sufficient space were available, a new dwelling might be constructed to accommodate a child at the time of his or her marriage. There are also cases where childless couples invited a nephew or other close kinsman to occupy a vacant house at their site.

Conversely, corporate family organization appears to have been successful only when the joint family was based on parents and children, siblings, or first cousins. We know of several cases in which the death of the last male in a generation of siblings or first cousins was followed by a dispute and the physical subdivision of the original site. An interesting result of this process was that households occupying only a fraction of what had been much larger sites frequently became as large as those existing before the division, and this in the space of a generation or two. Very small sites, which are likely to have resulted from this type of subdivision, appear most frequently toward the center of the city—a fact that possesses considerable demographic interest if we observe that the depth of occupation there is likely to have been four or more generations, as against the two or three generations that would be more probable in peripherally located districts.

The Tenochtitlan household compound most closely resembles the individual apartments within the Teotihuacán apartment compounds in scale (see R. Millon 1970b:1079-80), but it was an architecturally free unit, in the sense that each compound at Tenochtitlan enjoyed direct access to streets and canals and was related to neighboring sites mainly by physical juxtaposition, rather than by assimilation to large unitary structures of the Teotihuacán type. This, in turn, may reflect a greater freedom in the organization of productive activities and interpersonal or interhousehold bonds, as well as greater possibilities for upward mobility based on wealth or personal achievement than was characteristic of Teotihuacán society. Even commoners could achieve high rank through military service or the acquisition of great personal wealth (Durán 1951, vol. I:239 ff., vol. II:124, 164-65, Sahagún 1950-69, Bk. 9). The architectural segregation of relatively small residential compounds permitted the public display of status markers—most commonly architectural ornamentation—to distinguish individual compounds from even their immediate neighbors (Tezozomoc 1944:144).

The organization of residential neighborhoods in Tlatelolco was essentially the same as in Tenochtitlan, but the higher-level administrative divisions followed a different pattern. The quadriform layout, as already noted, was absent in Tlatelolco. Instead, there were fifteen to twenty *barrios grandes*, each subdivided into a number of *barrios menores*. San Martin Atezcapan, for example, included the *barrios menores* named San Martin Tlilhuacan, Pochtlan-Telpochcaltitlan, Zacatlan, and others. Early archival texts designate both units with the term *tlaxillacalli*, and administrative functionaries at both levels as *tlaxillacaleque*. Unfortunately, I know of no archival materials in which the term *calpulli* occurs, with the result that the articulation between the two kinds of units cannot be established at the present time. Similarly, we lack precise information that would clarify the relation between each of these divisions and architectural markers of the type described above for Tenochtitlan. That the *barrios grandes* included a large temple complex is suggested by the symmetrical arrangement of colonial period churches in relation to the ceremonial precinct of Tlatelolco—a point first noticed by Barlow (1947). It is highly probable that Barlow was correct, but the point as yet lacks direct archaeological or historical verification.

The quality of the information available for a study of Tlatelolco's internal organization is, in general, greatly inferior to that which exists for Tenochtitlan. It is highly probable that the large and small barrios of Tlatelolco were integrated to a

chain-of-command structure culminating in the local *tecpan*, and ultimately in the palace at Tenochtitlan—at least following Tlatelolco's conquest in 1473. After 1473 the monarchy at Tlatelolco was abolished and replaced with a system of military governors (*cuauhtlatoani*) appointed by the ruler of Tenochtitlan (see, for example, Sahagún, 1950-69, Bk. 9:2).

In any event, it would be relatively easy to conclude from the architectural and settlement pattern evidence that what might be called "Greater Tenochtitlan" incorporated two major subdivisions, with the internal structures of each differing in significant respects. It might, on the other hand, be extremely difficult to determine the precise political relationship between the two foci of political and religious organization at the time of the Spanish Conquest. Tangible indications of Tlatelolco's subordination are not clearly represented in the material summarized to this point, and one might easily conclude that we are dealing with a dual system, established early in the history of the city and maintained unchanged throughout its subsequent development.

Whatever the answers to these and similar questions, it is evident that a clear understanding of the urbanization process and its consequences for the development of particular types of internal structure requires that we exploit every available source of archaeological and ethnohistorical information. The advantages of working from historical texts, as compared with purely archaeological inference, are virtually self-evident in the case of Tenochtitlan-Tlatelolco. The disadvantages resulting from the scarcity of archaeological information are relatively minor as compared with the opposite situation as it exists at Teotihuacán. In the case of Tenochtitlan, for example, it is not necessary to develop complex procedures designed to clarify the nature of social groups in residence in particular types of residential structures. In a substantial number of cases, the question is answered by documents that give us the names and genealogies of individual household members.

Although no attempt has been made in this chapter to make a detailed survey of the similarities and contrasts in settlement pattern and social organization at Tenochtitlan and Teotihuacán, enough has been said to show that a comparison of the physical layouts of the two cities can be illuminating when interpreted in the light of relevant historical information. Further work in this direction must, of course, await not only the completion of research relating to Tenochtitlan, Teotihuacán, and other large Mesoamerican cities, but also fuller publication of the results than has been possible up to the present time.

—1976

Notes

1. This is a substantially revised and expanded version of a paper entitled "The Internal Structure of Cities in America: The Case of Tenochtitlan" presented at the Thirty-Ninth International Congress of Americanists in Lima, Peru, in 1970. I am indebted to René and Clara Millon for valuable comments on the earlier version. The archival investigations cited here were supported by research grants from the National Science Foundation and the University of Rochester.
2. The interpretation of fourteenth-century dates as expressed in the Aztec calendar system remains uncertain. The traditional chronology, in which the year 2 Calli is equated to A.D. 1325, is employed in this chapter and is valid for all fifteenth- and sixteenth-century dates. Fourteenth-century dates, however, may be too early by as much as twenty to forty years. See Kirchhoff (1950), Jiménez Moreno (1954-55), and Caso (1967) for more detailed discussions of this problem.
3. Archival evidence that I have obtained but have not yet adequately studied may permit a more detailed description of Tlatelolco's internal structure at a later time.
4. It is worth noting that the larger hydraulic enterprises undertaken by the Aztecs were carried out under the direction of specialists from Texcoco. This suggests a lack of both interest and experience on the part of the Aztecs.
5. Archaeological evidence obtained during the excavations at Plaza de las Tres Culturas in Tlatelolco and the recent Metro constructions may contribute significantly to our knowledge, but the data have not yet been analyzed or published in sufficient detail.
6. See Carrasco (1971:364) for a somewhat different interpretation.

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26

The Prehistoric Tepehuan of Northern Mexico[1]

by Carroll L. Riley and Howard D. Winters

The question of contact between the archaeologically known cultures and those of historic peoples is one of considerable magnitude in the north Mexican area. Archaeological evidence indicates a number of relatively high cultures, including Malpaso-Canutillo (Zacatecas), Chalchihuites (Durango), and the Chametla-Aztatlan-Culiacan horizons of the west coast. In addition there was a simple hill or mountain, agricultural, pottery making culture called Loma San Gabriel, known mainly from Durango, but perhaps linked to similar cultures extending along the flanks of the Sierra Madre Occidental from Jalisco to the southwestern United States.

Historic groups in the area include a band of Piman-speaking peoples (Upper and Lower Pima, Northern and Southern Tepehuan, and Tepecano) extending from the Gila River of Arizona to northern Jalisco and intersected by a wedge of Taracahitian-speaking groups, the best known of these being the Tarahumara, Opata, and various Cáhitan groups of the west coast (Yaqui, Mayo, etc.). Around the peripheries of these two distributions are people speaking dialects, sometimes called Aztecoidan, related to Nahuatl. The present paper, however, is limited to discussion of the Piman-speaking Tepehuan and their relationships to the prehistoric hill culture Loma San Gabriel and the high culture known as Chalchihuites.

Present Tepehuan distribution is fairly complex in nature (see Figure 1). There are three distinct groups, the Northern Tepehuan of the Durango-Chihuahua border area, the Southern Tepehuan of Southern Durango and Nayarit, and the Tepecano of northern Jalisco. In early records no attempt seems to have been made to distinguish among these groups (unless one or the other was included under some other name). Some years ago, however, J. Alden Mason (1952:37) very cogently pointed out that

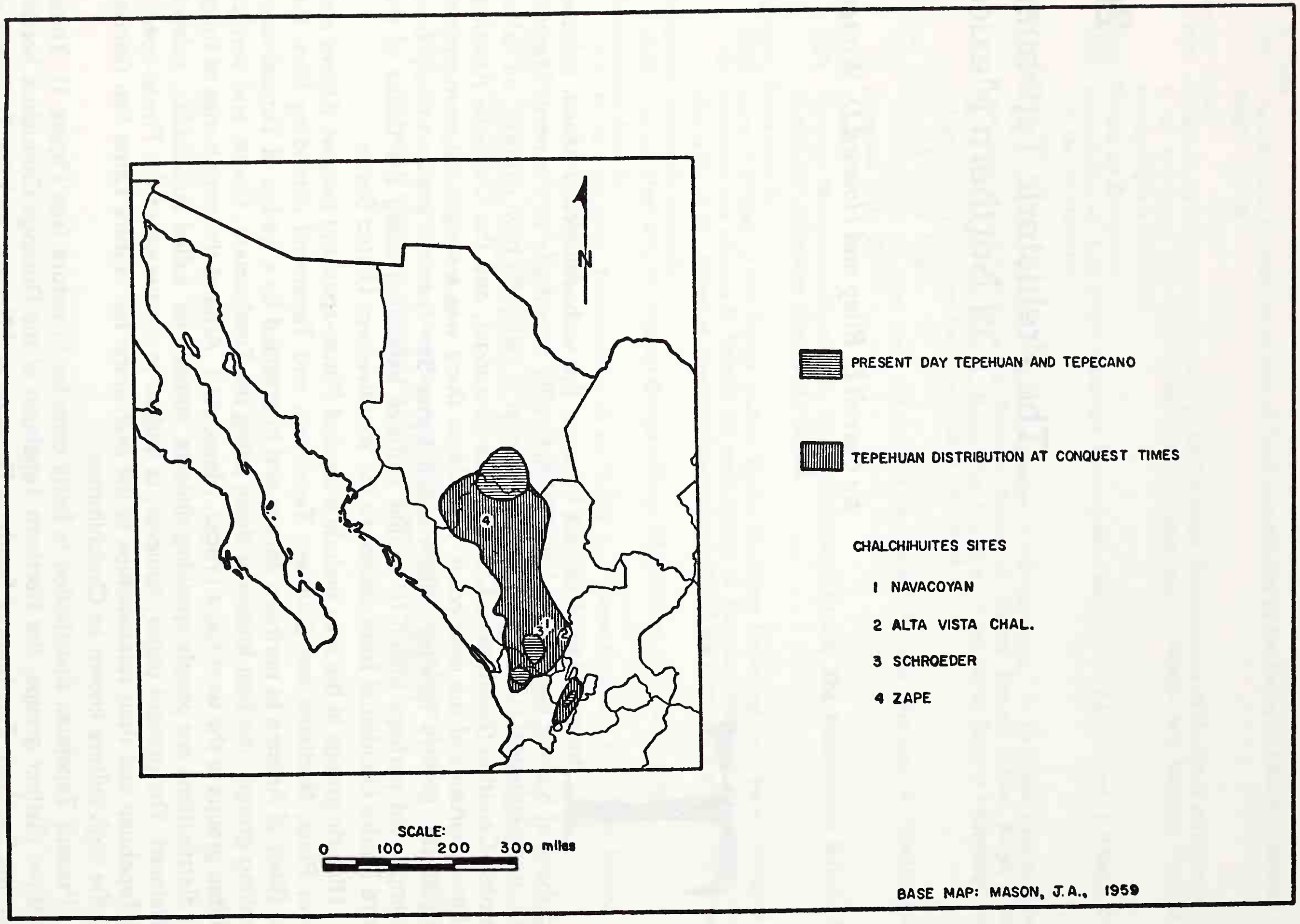

Figure 1. Tepehuan-Tepecano distribution at time of conquest and at present.

whereas the Tepecano and the Southern Tepehuan are nearest in culture and have mutually intelligible languages, the Northern Tepehuan have a rather different language, involving certain archaic characteristics such as retention of final vowels. In addition, the Northern Tepehuan seem to be quite Mexicanized (and perhaps also Tarahumaraized) and the Tepecano, too, are highly acculturated. Presumably, both these Southern Piman groups have fewer pre-conquest culture traits than have the isolated Southern Tepehuan. In this paper, unless specifically stated otherwise, all comparative data are drawn from the Southern Tepehuan. The latter are agricultural hill people, living in scattered rancherias with rectangular, adobe stone houses that probably derive from prehistoric prototypes. There is considerable retention of native culture which is manifested in the essentially paganistic religion (where there is extensive syncretism), in social organiation, medical practices, technology, and material culture (Riley and Hobgood 1959:355-356).

The possibility of connections of Tepehuan with Loma San Gabriel and with Chalchihuites lies in the series of specific connections between modern Tepehuan materials and those of the aforementioned cultures, and in the known or implied early historical distribution of Tepehuan Indians. First, it might be well to sketch the sequence of events in the Durango area in prehistoric times. In the third or fourth century A.D., the carriers of the high culture, Chalchihuites, arrived in the Zacatecas-Durango border area.[2] The culture was characterized by large ceremonial centers, elaborate bichrome ceramics, including tripod and (later) basket-handled vessels, as well as plain brown and red wares, a well-developed ceremonial and political organization, and generally sophisticated technology. In subsequent centuries Chalchihuites spread northward in a narrow band between the Sierra Madre Occidental and the desert into northern Durango. There is one suggestion—though this is by no means certain—that the area was already occupied by peoples of the Loma culture; or possibly Loma peoples already living in the uplands gradually moved into the orbit of Chalchihuites (Kelley and Winters 1960:549; see also Kelley 1956).

At any rate, by the last part of the first millenium A.D., Loma peoples were living adjacent to Chalchihuites and were interacting with them, as evidenced by the presence of the distinctive Loma ceramics in the Chalchihuites ceremonial centers at least as early as A.D. 800. As suggested by Winters in a paper given to the American Anthropological Association in 1959, some of the Loma people may have become the peasant and artisan classes within Chalchihuites. If so, the Loma people adopted Chalchihuites ceramic traditions, at least for decorated pottery, at such "residential" sites as La Manga near the city of Durango. These Loma-like house platforms are associated with Chalchihuites decorated ceramics and a utility pottery which in itself suggests a mixture of the Loma and Chalchihuites traditions. Loma pottery consists mostly of plain brown and textured wares or red wares, with occasional crude copies of more elaborate vessel forms and decoration from Chalchihuites (including tripod feet) and red-on-brown pottery suggestive of the late Chalchihuites pottery type, Canatlán Red Band. Of course, it is remotely possible that Chalchihuites plain wares (perhaps used in everyday tasks in contrast to the more elaborate, ceremonial pottery) were indigenous to a Loma-like population overrun by Chalchihuites and so generically related to the specifically Loma ceramics of the hills. While Chalchihuites and Loma ceramics can be distinguished by features of paste and tempering, many vessel forms and methods of surface treatment are shared, and both types of utility pottery belong within a single ceramic tradition, no matter what processes were involved in the development of such similarities in ceramic technology.

The last phase of Chalchihuites, the Calera Phase, represents perhaps a revital-

ization of Chalchihuites, with previously deserted sites reoccupied. There does not, however, seem to have been the extensive building activity of some earlier periods. Certain elaborations on the basic red ware tradition appeared and one decorated ware, Nayar White-on-Red, represents a segment within a wide distribution of similar decorated pottery along the west side of the Mesoamerican area from Guatemala to the American Southwest (Peithman 1961). The Calera phase (and, thus, the Chalchihuites culture) is supposed to have ended around A.D. 1350, though certain diagnostic pottery, particularly Canatlán Red Band, may have continued till a later date. Of considerable interest is the continuation of generic red wares in the Durango area. Surface collections in sites along the Tunal River, just south of the city of Durango, produce red slipped pottery, in what seems to be a Chalchihuites tradition, but wheel-made and sometimes glazed, therefore post-Spanish.

Archaeologically, then, we have the two separate but more or less inter-digitated cultures, Chalchihuites and Loma San Gabriel. The distribution of Loma sites (plus the probably-related brown ware cultures) suggests the distribution of historic Piman people, while Chalchihuites, as we shall see, seems to have contributed certain specific items to the southernmost Pimans, the Tepehuan.

Though Chalchihuites ended as an entity around or perhaps a little after A.D. 1350, the Loma culture seems to have lasted longer, and there may have been a reemergence of Loma following the disappearance of Chalchihuites. On the Loma frontier, a variant of the Loma tradition appears intrusively as far south and east as the great ruined site of La Quemada (near Zacatecas), where it may possibly be related to the historic Zaceteco Indians.

The Spaniards entered the Durango area in the third and fourth decades of the 16th century. Early accounts indicate that there were warlike Indians in the region though they are not specifically identified. In 1563, the city of Durango was founded in the Guadiana Valley of Southern Durango, only a few miles from the large Schroeder Ruin, one of the main Chalchihuites sites. Though we have little information for the early years, it seems likely that choice of the Guadiana region was due, in part, to the availability of considerable numbers.of Tepehuan Indians for labor (Mota y Escobar 1930:166, 177-179). In the latter part of the 16th century, there was an expansion of Spanish settlement up the eastern edge of the Sierra Madres roughly following the line of Chalchihuites settlement a thousand years before.

The first detailed information on the Tepehuan comes in the year 1616 with the sudden violent outbreak of the great Tepehuan rebellion. In the information concerning that rebellion, particularly in a brief account written in the year 1618 and in investigations of subsequent years, a fairly good picture can be gained of the distribution of Indians called Tepehuan. It is, first of all, clear that large concentrations of such Indians inhabited the villages around the city of Durango. Other Tepehuan were found in the Canatlán-Sauceda area to the north; San Juan del Rio in east central Durango; Papasquiaro, Atotonilco, and Santa Catalina in central Durango; Zape, Guanaceví, and Indé in northern Durango. In addition, groups of Tepehuan west of Durango City are mentioned and there is a suggestion that they may also have been on the Zacatecas-Durango border area east of the capital. From the accounts, it also seems fairly clear that the Tepehuan Indians were living in the area directly south of Durango City, where they are found today. From church lists of baptized Indians taken only a decade after the rebellion, it seems that most of these places had permanent populations (Hackett 1926:101-115, 119-147). There is no indication whatsoever as to the exact identification of the Tepehuan in the early centuries. One might hazard a guess that the Tepehuan of the Durango area were Southern Tepehuan but, at present, there is no way of demonstrating this.

In any case, the modern Southern Tepehuan carry certain traditions of Chalchihuites culture. For one thing, Tepehuan plain ware pottery (made in a number of vessels forms) is, in a general way, in the Chalchihuites tradition. Occasionally, red slipped pottery appears among the Tepehuan; and until recently the tripod form was used, and vessel handles, somewhat Chalchihuites-like, are common. Tepehuan ceremonial pottery is sometimes scalloped, a possible carry-over from small unpierced lugs on Ayala phase Chalchihuites vessels. Neckless, globular vessels with sharply flaring rims are also made by Tepehuan potters. This distinctive form occurs in the Chalchihuites culture, where it probably does not appear until Calera phase times. Like Chalchihuites pottery, that of the Tepehuan is non-wheel made. Some of the Tepehuan vessel shapes are reminiscent of those appearing in the Calera phase in the area around Durango with the tripod vessels being identical in concept, although much cruder, unslipped, and undecorated.

Other striking and quite specific similarities exist. A rather elaborate terraced stone incense burner appears in Chalchihuites and an almost identical copy in wood used by modern Tepehuan for burning resin incense (see Figure 2). Even more obvious, perhaps, are Tepehuan clay pipes (see Figure 3). These elaborately incised and polished platform pipes are so similar to Chalchihuites pipes of Calera phase that we originally suspected the Tepehuan of using pipes found in prehistoric ruins. This

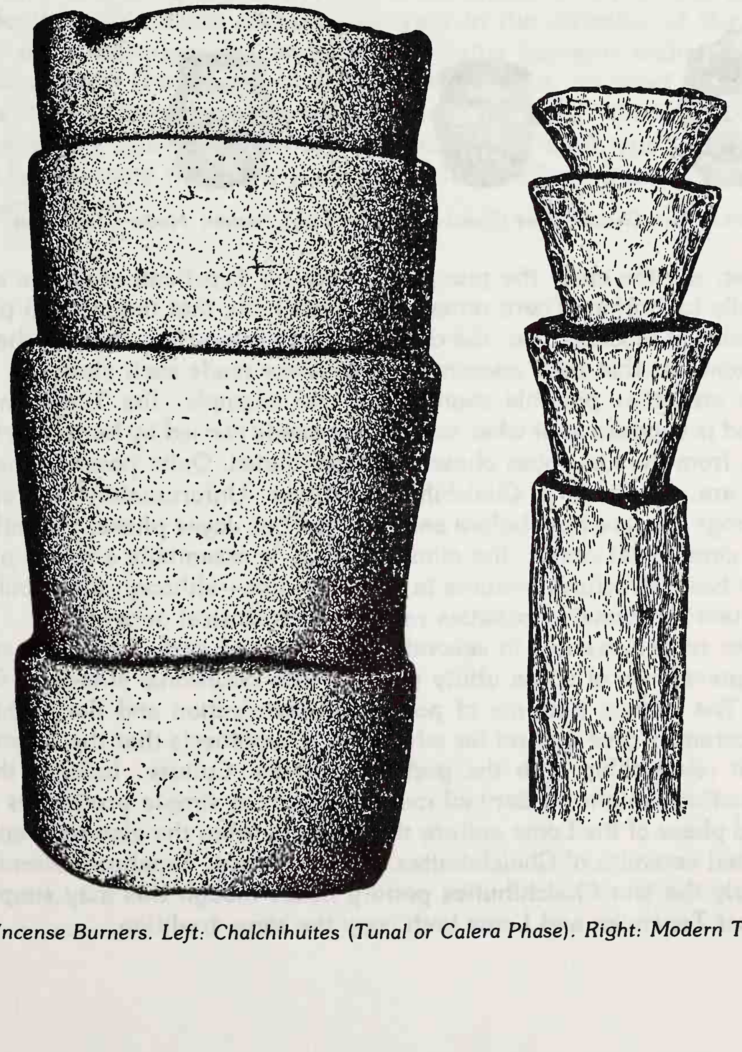

Figure 2. Incense Burners. Left: Chalchihuites (Tunal or Calera Phase). Right: Modern Tepehuan.

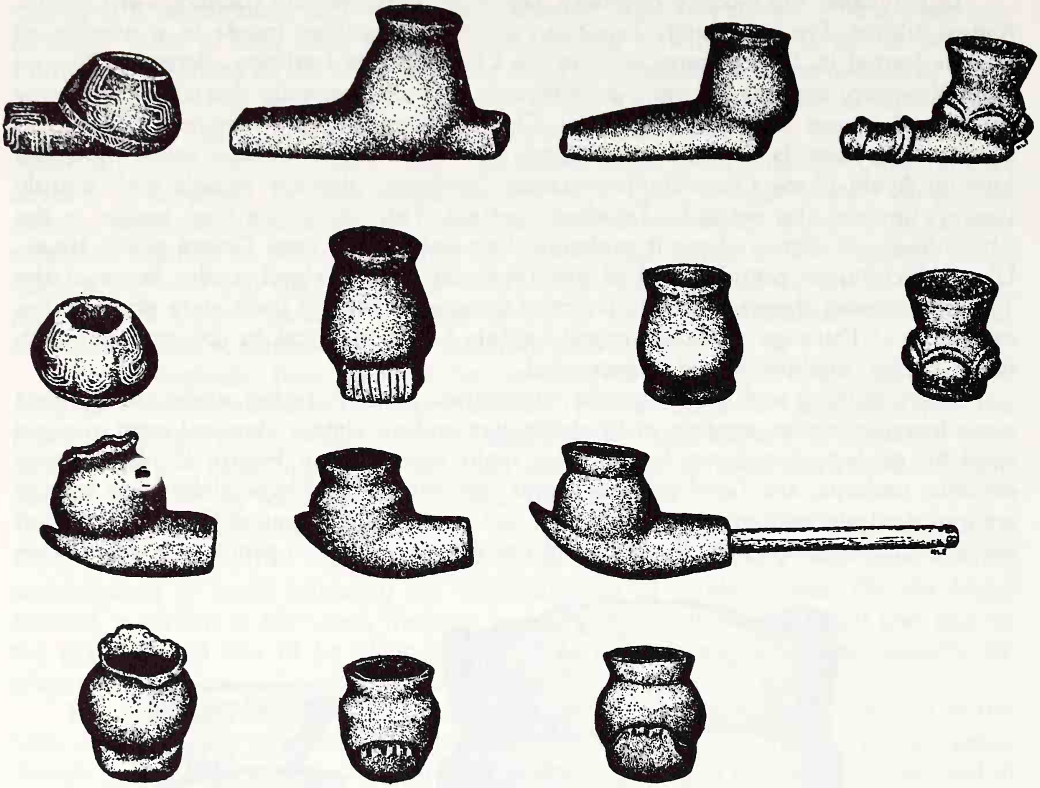

Figure 3. Top: Chalchihuites (Tunal or Calera phase). Bottom: Modern Tepehuan.

is, however, not the case; the pipes are made by Tepehuan shamans and are used ceremonially for curing. There remains the possibility that the modern pipes are only copies of ancient models; if so, the copying began some time ago, for the present-day shamans consider that their ancestors have always made such pipes.

There are other possible connections—for example, the Tepehuan ceremonial dance wand is suggestive of what seem to be wands carried by human beings pictured on pottery from the Las Joyas phase of Chalchihuites. Quite possibly these wands, if such they are, continued in Chalchihuites culture. Unfortunately, representations of human beings are rare both before and after the Las Joyas phase. Parenthetically, the Tepehuan ceremonial center, the *mitote* ground, is essentially a raised platform similar to such basic structural features in Chalchihuites—although this similarity may be due to certain functional necessities rather than historical derivation.

Surface reconnaissance in several of the areas of early Tepehuan settlement indicates a prevalence of Loma utility pottery, with occasional sherds of Chalchihuites ceramics. The historic patterns of population distribution and the prehistoric distribution of ceramics give ground for advancing a hypothesis that the historic Tepehuan have some relationship with the prehistoric Loma Culture. Indeed, the Tepehuan ceramic tradition might be derived more easily from simple prototypes of the Chalchihuitized phase of the Loma culture than directly from the elaborate and technically sophisticated ceramics of Chalchihuites. In some ways, Tepehuan ceramics resemble more closely the late Chalchihuites pottery itself, though this may simply be due to the fact that Tepehuan and Loma both copy the same tradition.

Specific non-ceramic relationships of Tepehuan to the simple Loma culture are more difficult to define than those with Chalchihuites. But one is probably important: the modern Tepehuan house seems to be essentially the same as the Loma house. It must be stressed here, however, that Chalchihuites houses at sites like La Manga also follow a ''Loma'' tradition. Certain other minor features suggest Loma: for example, Tepehuan stone spindle whorls strongly resemble Loma disks (unperforated, however) found in the Durango area. In religious features the resemblance of Tepehuan to Loma is negative, for there is a lack of elaborate ceremonial structures, developed priesthood, etc., among all modern Tepehuan and Tepecano Indians.

With the foregoing in mind, a tentative working hypothesis can be suggested to be validated or refuted by further archival, archaeological, and ethnological work. We suggest that the Tepehuan are descendants of a Chalchihuitized Loma group who had been living in the area of eastern and central Durango for many centuries before Columbus. After Spanish entry into Durango, the Tepehuan were first friendly (or over-awed), but later made one major effort to dispel the invaders. With the failure of this attempt, they withdrew into inaccessible parts of the Sierra where, in the south at any rate, they found refuge and managed in part to carry on their old life. The linguistic problem, that of the divergence between modern Northern and Southern Tepehuan, is still unsettled, but possibly the two groups were linked at conquest times by intermediate dialects that have since disappeared; for it now seems that some local Southern Tepehuan dialects may vary in the direction of the Northern Tepehuan. If our suggestions for bridging the hiatus between archaeological and historic peoples in this Durango area should prove correct, we shall have a culture sequence for the Durango area extending into the past almost 2,000 years. Demonstration of connections will not only be valuable for itself, but will also provide another base for attacking the larger problem of Mexican-Southwestern interrelations both in time and space.

—1963

Notes

1. A preliminary draft of this paper was presented by C. L. Riley at the American Anthropological Association meetings at Minneapolis in November, 1960. The archaeological information is mainly derived from the research projects directed by Dr. J. Charles Kelley in the Durango-Zacatecas area—part of the continuing program of Southern Illinois University in that area. The ethnological work was supported by grants (M-3565, C-1 and C-2) from the National Institutes of Health, United States Public Health Service.
2. From present evidence the Chalchihuites culture can be divided into five phases, dated approximately as follows: Alta Vista, A.D. 250-500; Ayala, 450-700; Las Joyas, 700-950; Rio Tunal, 950-1150; and Calera, 1150-1350.

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27

Human Sacrifice and Warfare As Factors in the Demography of Pre-Colonial Mexico

by S. F. Cook

The population problems of Latin America are of considerable importance to the student of human sociology and biology for numerous reasons, not the least of which is the fact that in this area has proceeded nearly to completion a fusion of two distinct races to form a new type, the so-called mestizo. The process began with a violent collision between an invading, Caucasian group, and a native, mongoloid stock. In many areas, notably in Central Mexico, the former group was numerically small, the latter large. A long series of readjustments followed, characterized in particular by the formulation and rise of the intermediate, hybrid form. To follow this evolution throughout four centuries and understand its implications, it is, however, desirable to appreciate the demographic background, insofar as it concerns the native race, and to expound the forces there at work at the time of the conquest by the Spanish.

In A.D. 1519 the empire of the tripartite alliance which, under Moctezuma II, represented the culmination of the steadily developing civilization of two thousand years, was one of the most remarkable achievements of mankind. Without the knowledge of iron, without the use of any really effective technology, without the support of domestic animals, the Aztecs and their colleagues created a social and material culture that excited the wondering admiration of even their sophisticated conquerors. Two of the most striking external manifestations of this culture were excessive human sacrifice and uninterrupted warfare.

According to the classical concept as set forth by at least the older writers, the focal point of the entire Nahua civilization was a type of religion which in turn centered around human sacrifice. This trend became intensified during the last two hundred

years prior to the Spanish conquest to such an extent that the local population could not supply the demand for victims. As a result, wars and forays were undertaken far and wide to satisfy the requirements of the temples. Thus war and religion became inextricably involved with each other on the material level and were simultaneously rationalized into a spiritual unit. Military operations were possible on a scale much greater than elsewhere in primitive America because the Central Mexican plateau and adjacent coasts contained a population of such a remarkably high density as to provide continuous replacement to compensate for losses in battle and by sacrifice.

As an institution, human sacrifice has been known to all primitive peoples at all times in the world's history. In Mexico there is some ground for believing that it was employed by the races inhabiting the country in the Teotihuacán period although the "Toltecs" are generally credited with not embracing the custom. The Aztec and Spanish writers of the sixteenth century generally ascribed its origin to the late Chichimec period, prior to the founding of the Tenochtitlan. The *Codex Boturini* (Radin translation, p. 33) depicts a sacrifice in the time of Aacatl, supposedly somewhere in the eighth or ninth .centuries. According to the *Codex Chimalpopocatl*, the great king Quetzalcoatl at Tula did not offer sacrifices although he was strongly tempted by the devil to do so. The *Codex Ramirez* (Radin translation, p. 74) recounts how, when the Aztecs were at Tula, the god Huitzilopochtli became angry because some members of the tribe wished to remain at that locality. One morning these persons were found with their hearts torn out. "In this way it was that they were taught that most cruel of sacrifices . . ." Durán (p. 26) places the first sacrifices just prior to the arrival of the Aztecs at Chapultepec, that is, sometime between 1150 and 1200. Among modern scholars, Mendizabal (p. 621) is convinced that sacrifice was introduced by the nomadic Chichimecs, particularly the Otomi at the end of the "Toltec" era, since the latter people did not possess the institution. Preuss and Mengin (p. 49) similarly state: "It is thus clear that before the invasion of the Naua-Chichimecs some form of human sacrifice already . . . existed, but that its development and specific character was due largely to the Chichimecs, and particularly to the warrior Naua."

Although there is thus general agreement that human sacrifice was known and probably thoroughly incorporated in religious practice before the final settlement of the Aztecs at Tenochtitlan, the institution at that time retained its purely religious significance as an occasional and very solemn act of propitiation to the gods. It was apparently not until the fifteen century that the practice of immolating prisoners of war in masses became common. Torquemada (p. 94) says that in 1330 the Mexicans sacrificed a captured Culhua, with the implication that this was the first case of the sort, but subsequently (p. 126) he mentions A.D. 1428 with the remark that "even at that time they made war to capture victims." Some writers even placed the inception of the custom later. For instance, the *Codex Telleriano-Remensis* (Radin translation) claims: "All the old people say that from the year 1465 . . . the custom of sacrificing prisoners taken in war commenced . . ." Ixtlilxochitl (*Historia Chichimeca*, p. 240) ascribes the origin of the custom to the famine of 1454: "Thus these wars began, and also the abominable sacrifice to the gods, or (better to say) to the demons . . ." On the whole it is safe to ascribe the beginning of the sacrifice of captives to the very early fifteenth or late fourteenth centuries. The development of the custom to include huge numbers occurred not much prior to the middle of the fifteenth.

It was precisely at this period that the population density of Central Mexico was reaching its maximum and that the margin of subsistence was becoming somewhat precarious. With respect to the demography of the times, there are two issues: first, was the mortality due to sacrifice sufficient to act as a serious check on population

increase; second, was this custom a manifestation of a social urge toward such a check.

The second issue is one of extreme difficulty and one which cannot be settled by numerical analysis. Nevertheless the suggestion is worth consideration. It is quite clear at the outset that the religious element cannot be disregarded for it carries great weight. The argument advanced by the sacerdotal class was simply that since human blood was pleasing to the gods, the more blood the greater their pleasure and the greater the benefits to be derived therefrom. But it seems inescapable that this was merely the rationalization of a far deeper tendency or drive. Certainly had it been socially undesirable to perform these acts of sacrifice, very cogent reasons would have been found for not doing so.

The predominant use of war captives is puzzling if the custom is to be regarded as directed toward limiting the population of the tribe itself. However, it should be borne in mind that the entire economic structure and the whole biological complex included all of Central Mexico together with its many linguistic and tribal units. Therefore, whenever the local state, Tenochtitlan or Hueyozingo or Tezcoco or Tlaxcala, immolated its neighbors, it was, in effect, limiting its own population, or at least, balancing the food supply and economic resources upon which it, together with its neighbors, depended. Even the destruction of remoter peoples, such as in Guerrero, or Oaxaca or the Huasteca, achieved the same end by permitting the expansion of the conquering population into new territory and thus restricting not its own total number but its density per unit area. The close association with warfare is obvious. Military operations were inevitable for other purposes, to repel assault, to protect commercial interests, to open new regions for economic exploitation. As a by-product, the population problem could be attacked indirectly by massacre on the spot, or with greater moral justification and religious satisfaction and profit by formal sacrifice.

The sacrifice of slaves was roughly equivalent to that of war prisoners, since both were derived from outside the immediate body politic, and any captive taken in battle automatically assumed the status of slave. On certain occasions, however, it appears to have become necessary to fall back on the method of purchase rather than capture. After one of the wars in Oaxaca, for example, as described by the *Codex Ramirez* (p. 132), victims became so scarce that parties were sent out daily to the public markets at Tlaxcala, Hueyozingo, Cholula, Atlixco and elsewhere so that instead of jewels, sacrificial victims might be purchased. In *Ritos Antiquos* (p. 26) occurs the significant statement in reference to the slave slaughter at the annual festival of the *mercaderes* at Atzcopotzalco, ". . . for the feast they got slaves to be sacrificed, and they were found cheaply, *as the land was well populated.*" Obviously slaves would not be purchased merely to kill them if the supply were not far in excess of the demand in the labor market. However powerful, no purely religious urge can maintain itself successfully for any material period of time counter to fundamental economic resistance.

In the century preceding the conquest, not only war prisoners and slaves but also children were sacrificed. This destruction of infants is especially significant since they were the offspring of the tribe itself. Indeed, child sacrifice seems to have been regarded as so important that no social class was immune for "these were not slaves but sons of the nobles" (*Ritos Antiquos*, p. 25). The numerical as opposed to the ceremonial importance, however, is difficult to assess, for there are few details available. Sahagún's account is the most circumstantial. At the feast of Atlacahualco, he says (vol. I, p. 71) ". . . they searched for a great many infants, buying them from

their mothers,'' and killed them at seven places on hilltops and in the Laguna de Mexico. He elsewhere states (p. 54), ''According to the reports of some people, they collected the children they sacrificed in the first month, buying them from their mothers, and then killed them at all subsequent festivals until the rainy season came in full force.'' The payment to the families might be regarded not only as direct compensation for property loss (this alone in the case of slaves) but also as some recognition of an obligation incurred by the state to the individual family through the sacrifice of the child for the public welfare. Sahagún (p. 52) also mentions that at the feast of Tozotontli ''they killed many children.''

The *Codex Magliabecchi* mentions several occasions on which children were the victims. At the feast of Xilomaniztli (lamina 17) ''they sacrificed children . . . which were drowned in canoes.'' Drowning seems to have been the standard method for disposing of children. At the feast of Tocoztli (lamina 19) ''they sacrificed young children and young girls, and also newborn babies.'' At the feast of Zazitocoztli (lamina 20) they sacrificed ''the children at dawn.'' At that of Ecaloaliztli (lamina 22) ''they offered . . . newborn babies.'' At that of Michayehuitl (lamina 25) ''they sacrificed children'' and ''on that occasion the feast of the dead children was celebrated . . .''

Both these sources agree substantially that during at least five out of eighteen annual religious festivals numerous infants and small children were sacrificed to various gods. Just how numerous is uncertain. How many is ''many''? If Sahagún is correct in stating that at one feast the ceremonies were held on seven hilltops and at the lake then we might suppose that perhaps one hundred were involved in all. Certainly at each hilltop ceremony the number would be several and judging by other accounts the sacrifice at the lake was on a considerable scale. Then if the three or four other sacrifices were of comparable magnitude, the total annual loss was, say, five hundred.

Similar customs prevailed elsewhere on the plateau. At Tlaxcala (Camargo, p. 199), ''The victims who were sacrificed were . . . on several occasions . . . newborn infants.'' Pomar, in his account of Texcoco, says that at the celebration of Tlaloc ''. . . ten or fifteen innocent children up to seven or eight years of age were killed.'' Some of the Spanish writers are more extravagant in their statements. Torquemada (vol. I, p. 287) says, referring to Cholula, ''Many of our people affirmed when entering the town that they considered as true the report that six thousand creatures of both sexes were sacrificed each year.'' Oviedo (vol. 3, p. 498) raises the estimate to ten thousand. This author (vol. 3, p. 499) also charges that during the massacre at Cholula by Cortés in 1519, the native allies ''carried over twenty thousand creatures, small and large, which were sacrificed''—a manifest absurdity. With respect to the whole country, Torquemada writes (vol. 2, p. 120), ''The first bishop . . . Frai Juan de Zumarraga, says in a letter, which he wrote on notable things of this Land, that every year twenty thousand children were sacrificed, according to count.'' Zumarraga's value, even though ''according to count,'' must be scaled down drastically. Nevertheless, if we remember that these sacrifices were carried on at perhaps one hundred cities, towns and other religious centers, we may conclude that at least 2,000 infants and small children were wiped out annually.

Such a number of deaths, out of a population of surely at least two millions, would increase the mortality rate by no more than a very few tenths of one per cent. This in itself is unimportant but as a symptom of a general tendency it has definite significance, for although child sacrifice as practised could not of and by itself serious-

ly check population increase, it was performed far too extensively to justify on purely ceremonial grounds.

The fact has been mentioned that people were sacrificed not only at Tenochtitlan but also at many other towns. The *Codex Ramirez* (p. 101) says: ". . . in this way they sacrificed all prisoners of war . . . and the same thing was done by all neighboring nations, imitating the Mexicans in their rites and ceremonies . . . This feast of Huitzilopuchtli was general throughout the land . . . and so . . . there was no province nor village which did not celebrate the feast in the said manner." Regarding this same feast, Durán (vol. III, p. 61) says ". . . in all the provinces of the Land, the feast was general." Ixtlilxochitl (*Historia Chichimeca*, p. 268) adds ". . . beside those referred to, they sacrificed many during the kingdom, in the city of Mexico as well as in Tezcuco and Tlacopan and the other populous towns and capitals of provinces under the empire . . . and in those provinces outside the empire, it was about the same." The early conquerors are quite explicit concerning the wide extent of the custom. Thus states Bernal Diaz (p. 138-140) after describing the condition of certain Totonac towns, ". . . we found the same thing in every town we afterwards entered," and ". . . but as many readers will be tired of hearing of the great number of Indian men and women whom we found sacrificed in all the towns and roads we passed, I shall go on with my story without stopping to say any more about them." Among the towns specifically mentioned as conducting such rites are Tezcuco, Tlacopan (Ixtlilxochitl), Cholula (Torquemada), Tlahquiltenango (*Codice Mauricio de la Arena*), Tlaxcala, Hueyozingo, Calpa, Tepeaca, Tecalca, Atotonilca, Quaquechulteca (Durán, vol. III, p. 60), Coatepec (Durán, vol. III, p. 151), Cotaxtla, Cempoala, Xocotlan (Bernal Diaz, pp. 138, 181). It is clear, therefore, in making any numerical estimate that, although Tenochtitlan was the most important single center, the outlying towns and provinces can by no means be neglected.

We have a few direct statements with respect to total numbers annually sacrificed. That of Zumarraga previously quoted, 20,000, although children (*criaturas*) are specifically mentioned, may have referred to all persons. This would correspond to that of Gómara who says (p. 285) ". . . and there was no year with under twenty thousand persons sacrificed, and over fifty thousand according to other references, in the land conquered by Cortés; but if even ten thousand, it was a great butchery . . ." Provisional acceptance of these Spanish estimates would place the number anywhere from 10,000 to 50,000 per year.

More numerous are statements with reference to individual festivals at specific towns. Durán (p. 60) maintains that at the principal fiesta, to Huitzilopochtli, more than 1,000 persons were customarily killed throughout all Central Mexico. At that of Xipe he says (p. 203) at least 6,000 were killed. At the 14th month, according to Motolinia (p. 38) ". . . they sacrificed, according to the size of the village, in some twenty, in others thirty, in others forty, and even fifty and sixty; in Mexico they sacrificed one hundred and over." If there were 100 towns and the average number was 40 then the total for this festival would be 4,000. There were 18 festivals per year—to correspond with the Aztec months—in other words, almost continuous activity in the temples. If the above three cases may be regarded as representative, the average would be about 3,000 per month or 54,000 per year. But most of the fiestas were on a smaller scale. Accordingly the average may be reduced to 1,000, the annual rate to 18,000.

Another item of evidence consists of the famous skull counts made by the Spanish soldiers. There appear to be two of these. The first was by Bernal Diaz who states (p. 181) that at the town of Xocotlan ". . . in the plaza . . . there were piles of human skulls so regularly arranged that one could count them, and I estimated them at more

than a hundred thousand. I repeat again that there were more than one hundred thousand of them.'' The second was by Andres de Tápia who examined, at Cortés' request, the great temple at Tenochtitlan. In his *Relacion* (p. 583), he describes the method of arrangement, then says: ''. . . the writer and a certain Gonzalo de Umbria counted the cross sticks which were stretched from pole to pole, as I have described, and multiplying by five skulls per cross piece we found there to be one hundred thirty-six thousand heads, without those of the towers.'' The towers were two in number, of considerable size, made of ''lime and skulls of the dead, without any other stone.''

The veracity of these statements, and of others cited above, has been seriously questioned by modern historians. As much discretion is necessary, however, in rejecting them as in accepting them. The early chroniclers, such as Motolinia, Gómara, and Durán, derived their figures from the statements of others, such as elderly natives and pioneer Spanish. Hence these figures are second-hand, perhaps subject to exaggeration and certainly to inaccuracy in detail, although I doubt if they deliberately distorted what they knew to be facts. Bernal Diaz and Andres de Tápia are in a different category. They were actual participants in the conquest, eyewitnesses of the events they described. Both can be accused of personal bias with reference to the politics of the day, the merits of Cortés and similar matters. But they both state emphatically that they actually counted the skulls in question and as accurately as they were able. They had no motive for falsification and both were reliable, competent soldiers. I can therefore see no reason for not accepting their figures at face value.

With respect to Xocotlan (and Diaz is positive in his identification of the town with no likelihood that he confused it with Mexico) we do not know how long the skulls had been collected. However, it is doubtful whether they antedated the period of Aztec domination, that is to say, the middle of the fifteenth century. If so, seventy years is a fair estimate. Diaz says there were ''more than'' 100,000, but we may use the flat value. Then the annual increment was approximately 1430.

In Tenochtitlan we have better dating. The temple was built previous to and dedicated in 1487, thirty-two years prior to Tápia's count. This would mean an average of 4,250 sacrifices per year, including the colossal slaughter which accompanied the dedication. Indeed, if we deduct 20,000 for the dedication, the subsequent rate would be 3,630. On the other hand the skulls reported by Tápia as embedded in the towers are not included in this calculation.

Accepting the rates above indicated for Tenochtitlan and Xocotlan, it becomes necessary to extrapolate to the entire region, a process which inevitably involves a large element of assumption. Tezcoco, nearly as large as Tenochtitlan, may be assigned 2,000 sacrifices per year and the remaining lake towns perhaps 500. Hueyozingo and Cholula may have accounted for 1,000 each. At Tlaxcala it is said by Gómara (vol. 2, p. 274) that at the regular 4-year festival 400 were killed at the big temple, 300 in each of the other three *barrios* and in each of the other 28 towns of the province ''algunos''—let us say 1,500 in all. Motolinia (p. 57) gives an estimate of 1,200 for the same festival. Counting in the routine monthly festivals, the annual average must have amounted to at least 2,500. Tepeaca, Chalco and vicinity may be allotted 1,000, the Morelos towns, 1,000, the Toluca Valley, 500, and southern Hidalgo and northern Puebla, another 1,000. The total for the Nahua confederacy and its immediate neighbors would then be approximately 15,700. In the outlying regions, Guerrero and the south coast, the Totonacapan, the Huasteca, the Mixteca, the Zapoteca, the Tarascan territory in Michoacan, sacrifices were performed but on a much

less extensive scale. If we allow 4,000 to 5,000 for these areas, the general total would amount to 20,000 per year.

A third source of information comes from the reports of war captives sacrificed. These were often reserved for special occasions such as the coronation of kings and dedication of temples. The most sensational single such butchery recorded took place at the dedication of the new temple of Tenochtitlan in 1487, an occasion which may serve as a prototype. The estimates of the slain which appear in the chronicles are almost unbelievable. The *Codex Telleriano-Remensis* (p. 141) says 20,000, Torquemada (vol. 1, p. 186) 72,344, Tezozomoc (p. 268) 80,400, Durán (p. 346) 80,400. The commemoration stone at the National Museum indicates 20,000 (Tezozomoc, p. 519, footnote), a figure accepted by Orozco y Berra (*Ann. Mus. Nac.*, vol. 1, p. 61).

In spite of the many detailed accounts we have no adequate description of how the sacrificial operation was performed. The standard statement is that the victim was thrown back downwards on the stone, being held by five men, his chest "opened" and his heart "snatched out" or "torn out" by the high priest or chief officiator. Immediately the body was thrown down a long flight of steps while the heart was offered to the god with appropriate ritual. Some estimate of the time consumed is possible. To seize the prisoner, already directly in front of the stone, and throw him down would not consume more than a minute, despite his struggles. What happens next depends upon the type of operation employed.

Torquemada (vol. 2, p. 117) after pointing out that the victim was bent nearly double, backward over the stone, states ". . . the supreme priest arrived armed with a knife, and opened him very deftly, and wide open in the chest, and in such a manner that it was scarcely heard or seen . . ." Motolinia (p. 38) says the chest was opened "with great strength" and "rapidly." The Anonymous Conqueror, who had exceptionally good access to information, states (p. 52), "He plunges the knife into the breast, opens it and tears out the heart . . . and this as quickly as one might cross himself." Pomar, in the *Relacion de Tezcoco*, (p. 17) specifies that the chest was opened "from one teat to the other."

It seems evident that the incision was made by a single hard blow with the obsidian knife directly through ribs and sternum such that a wide aperture was formed through which the priest could grasp and tear out the heart. A competent and practised operator should be able to finish within one minute. Another minute should suffice to throw the body down the steps (performed by assistants), stretch the heart toward the shrine, smear the idol with blood and throw the heart in a dish (performed by the priest). Three minutes thus appears a reasonable time during which a single sacrifice could be accomplished, although perhaps under great pressure and by omitting some of the ritual it could be done in two. As an absolute minimum the latter estimate may be accepted.

At the dedication ceremony there were four lines of captives, such that four could be killed simultaneously (Durán, p. 345). The king started but soon tired and was replaced by priests who worked in shifts. Rotating in this manner the process was kept going continuously (Tezozomoc, p. 517) for four days. Now two minutes per victim, four at a time, means 120 per hour. Assuming actual continuous operation for 96 hours (i.e., four days), the total would have been 11,520. Durán states in detail that the four lines extended up the temple steps from (1) the Cuyoacan road "casi una legua," (2) from the Calzada de Señora de Guadalupe, also nearly one league, (3) up the Calle de Tacuba and (4) east to the lakeshore. Calling a Spanish league equal to three English miles, each line was then about two miles long. The captives must have been in single file and if a linear space of three feet standing room is allowed for each

the total comes to 1,760 times 2 times 4, or approximately 14,100. These are both considerably smaller than any of the historical estimates but if we include the sacrifices which must have been performed in the adjacent temples and "cues" the figure of 20,000 accepted by Orozco y Berra appears wholly reasonable. The values of 70,000 to 80,000 mentioned by Durán, Ixtlilxochitl and Torquemada seem wholly out of line unless they were referring to the entire Nahua confederacy, in which case such numbers are possible but not probable. It is better, I think, to adhere to the more conservative and better authenticated estimate of 20,000 victims in Tenochtitlan and its immediate environs.

There are a few other cases of wholesale slaughter in the temple for which an actual numerical estimate is offered (most of these by Durán):

1442	War with Chalco	500 persons	(Durán, p. 144)
1447	Huasteca	6,000 persons	(Bancroft, *Native Races*, V:418)
1476	Tliliuquitepec	700 persons	(Durán, p. 298, p. 301)
1477	Metztititlan	40 persons	(Durán, p. 313)
1499	Tehuantepec	17,400 persons	(Ixtlilxochitl, *Hist. Chich.*, p. 272)
1503	Icpatepec	5,100 persons	(Durán, p. 423)
1506	Tlaxiaco	1,000 persons	(Durán, p. 501)
1507	Tututepec (2 campaigns)	3,650 persons	(Tezozomoc, p. 631)

The sum of the captives taken for sacrifice in the nine campaigns listed above, plus the holocaust of 1484, is 54,390, an average of nearly 700 per year. But these are only a few outstanding cases. In Appendix I are listed as many campaigns as can be clearly distinguished from the historical records, together with estimated battle casualties. Owing to the highly specialized mode of warfare developed by all the Mexican tribes, the number of captives was fully as large as that of the actual killed and perhaps may have been much larger. The total casualties incurred by both sides in wars in which the Aztecs participated, according to this compilation, was 248,700. Certain adjustments must be made, however, before accepting a final value. The first two wars, those waged at the time of the formation of the tripartite alliance, should be deleted, since the number of captives sacrificed was at that era relatively small. This leaves 192,700, a figure which includes the losses of the Aztecs themselves. Since the latter, however, were the dominant people, and were almost always the victors, their loss was definitely smaller than that of their opponents. A ratio of 2 to 1 in favor of the Aztecs would not be excessive. Hence the enemy losses in battle dead and likewise in captives would approach 130,000. If this figure is spread over the ninety years from 1430 to 1520 the annual average is 1,400. Finally, some account must be taken of the numerous raids and skirmishes which left no historical trace. Including these we may arrive at an annual average of 2,000 war captives sacrificed at Tenochtitlan. This appears a sounder estimate than the 700 mentioned above which was based upon an obviously incomplete record.

The Tápia skull count gives an average of 4,250 sacrifices for Mexico during the last thirty-three years of the empire. But since the number is known to have reached its maximum in the generation preceding the Spanish Conquest, the two estimates are not seriously at variance. Extrapolating the war captive figures to the whole territory in a manner similar to that used with the skull counts, we get an annual average for ninety years of 9,400. To these must be added the children, slaves, and others not taken in warfare, say 2,500, giving a total of approximately 12,000.

To summarize the preceding discussion the values obtained for annual sacrifice rate in Central Mexico are:

A. Direct estimates by the Spanish, covering last years prior to the conquest 10,000-50,000

B. Descriptions of individual festivals, covering last years .. 18,000
C. Skull counts, covering last 30-40 years 20,000
D. War captive estimate, covering last 90 years 12,000

Considering the sources of numerical information available, the four methods yield results surprisingly in agreement. Allowing for changes over a century, 10,000 to 20,000 persons were sacrificed per year, with an over-all mean of approximately 15,000.

To secure an exact appreciation of the magnitude of human sacrifice as a demographic factor, the possible birth and death rates should be considered. We have no direct information concerning these variables but it is known that among virile, moderately healthy primitive peoples, uncontaminated by venereal or epidemic disease, the death rate seldom rises over 40 or 50 per thousand persons per year. For purely illustrative purposes let us assume the latter value to have been characteristic of Central Mexican civilization. Furthermore, let us assume that the total population approximated 2,000,000. Then the basic, non-sacrifice death rate would have been 100,000 per year. Therefore a mean annual sacrifice rate of 15,000 would have augmented the death rate by roughly fifteen per cent, a quantity which, over one or two generations, could have been of material significance in aiding to control the population density.

The conclusion appears warranted that the first issue set forth previously, i.e., could human sacrifice have been sufficiently extensive to affect population trends, must be answered in the affirmative on the basis of available numerical data. The second issue, i.e., was human sacrifice the manifestation of an urge toward population control, can be answered by no means categorically. Absolute proof for such an hypothesis is wholly lacking. Yet the possibility cannot be lightly dismissed that a religious institution was unconsciously directed, one might almost say perverted, to a social and biological end during the later phases of Aztec domination.

Our interest in military operations is here confined to the magnitude of battle casualties. For a detailed discussion of other matters reference may be made to the treatise of Bandelier (1877), which has never been surpassed in its scholarly treatment of the subject.

The period which began with the founding of Tenochtitlan in 1325 and coincided roughly with the first century of Aztec autonomy appears to have been remarkably free from armed operations of any kind. There is no recorded war or expedition from 1300 to 1350. Bancroft (*Native Races*, V: 347) states that Tezcoco, during the reign of Techotl (1305-1357), was "almost entirely undisturbed by civil or foreign wars." Meanwhile at Tenochtitlan, according to the *Codex Ramirez* (Radin translation), "they were at peace and increased in numbers, mingling in business and social intercourse with the surrounding peoples;" and "the second king, Huitzilihuitl" (1359-1375) "ruled . . . during a time of great tranquility and peace."

In 1349 or 1350 occurred the war between Tezcoco and the group of migrating Nahuas known as Teochichimecs. A very bloody battle took place which resulted in the defeat of the invaders. In 1384 there was fighting on the eastern plateau between Tlaxcala and an allied group. In 1395 the Aztecs attacked the town, or province, of Xaltocan and crushed the rebellious inhabitants. These three are the only campaigns of sufficient consequence to have been recorded prior to the great struggle for supremacy between the allies and Atzcapotzalco which began about 1415. The inference is plain, and has been commented on by many writers, that during this long era of quiet the Nahua tribes, the Aztecs, Culhuas, and Tepanecs particularly but also doubtless the Chalcans, Hueyozincans and Tlaxcalans were increasing in number and

developing their agricultural and economic resources. Beginning at approximately 1415, however, the tripartite alliance launched its career of conquest and from that time wars were incessantly waged. It is, therefore, the final century prior to the arrival of the Spaniards during which warfare may have had a significant bearing on the status of population.

The size of armies as frequently stated by the sixteenth century writers is so huge as to call forth an immediate charge of gross exaggeration. Nevertheless there is some reason to believe that the exaggeration was not as great as might be supposed. Durán (p. 166), commenting on the Aztec power in the middle of the fifteenth century, avers that the central authority could easily field an army of 100,000 men, including those drawn from the home provinces. Now Bandelier (1877) points out that in Anahuac every citizen over the age of 15 years was a warrior and liable for military service. He elsewhere mentions that the city of Tenochtitlan was divided into four *barrios*, each of which was divided into 3 to 4 smaller districts. Each of the latter furnished on the average 300 men. This means a mobile reserve, for the ranks, of 3,600 to 4,800, say 4,000. But to these conscripts must be added the *principales* or nobles whose entire life was devoted to fighting. Their number was large, perhaps equal to that of the citizen soldiers. If so, then Tenochtitlan could put at least 8,000 men into a campaign. Tezcoco could furnish as many, Atzcopotzalco and Tlacopan nearly as many. When the smaller towns of the valley of Mexico are included, 100,000 is by no means an unreasonable estimate.

Some of the values for size of armies which have been mentioned are as follows:

1349. Tezcoco and allies against the Teochichimecs. Allied army 100,000 (Veytia, II:165).

1415. Tepanecs and Aztecs against Tezcoco. Allies had 200,000 (Bancroft, *Native Races*, V:372-379).

1428. Mexico, Tezcoco and allies against Tepanecs. In initial operations allies had about 100,000. Chalco and vicinity added another 20,000 (Veytia, III:93-106). In final campaign allies had 300,000, including 100,000 from Tezcoco and 70,000 from Mexico and Tlatelulco. Tepanecs had 300,000 (Veytia, III:127). In view of the desperate nature of this conflict, these figures may not be extremely exaggerated. Ixtlilxochitl (*Relaciones historicas*, p. 382, p. 407) cites substantially the same numbers.

1430. Mexico and allies against various towns. Allies had 100,000, including 10,000 from Tlaxcala and Hueyozingo (Veytia, III:157).

1458. Mexico against Coixtlahuaca, second campaign. Mexico raised an army of 20,000 (Durán, p. 201).

1476. Mexico against Tarascans. Mexican army 32,200, Tarascan 50,000 (Tezozomoc, p. 421), Mexican 24,000, Tarascan 40,000 (Durán, p. 288).

1494. Mexico against tribes of Tehuantepec. Aztecs started with an army of 200,000 and were joined by 100,000 allies (Durán, p. 397, p. 400). So many were in the army that not a man could be seen on the streets of the towns in the valley of Mexico (Durán, p. 370).

1503. Mexico against Icpatepec and Nopallan. This was a war purely to capture sacrificial victims. Mexican army 60,000 (Durán, p. 423).

1506. Mexico against Hueyozingo. 100,000 combatants on both sides (Durán, p. 451).

1506. Mexico against tribes of the Mixteca. Army of 200,000 (Durán, p. 455).

1515. Mexico against Quetzaltepec and Tototepec. Montezuma set out with all the troops at his command: 400,000 men and boys (Durán, p. 446).

Although some of these figures are excessive, others bear the stamp of quite reasonable accuracy. On the whole, the repetition of values ranging from 100,000 to 200,000, on the part of all contemporary writers, some of whom had known participants in these campaigns, must indicate that the Nahua armies were of the order of magnitude designated. Otherwise we must ascribe to these writers not only an incredible mendacity but also an incredible ignorance.

In the absence of any compelling argument to the contrary we may accept as fact that the Nahua confederacy was accustomed to operate with armies 100,000 strong and if a real emergency arose might levy as many as 300,000 men.

For ordinary wars the mobile field army of approximately 100,000 men could be

called into action. This consisted no doubt of the best fighting strength available—all the young men from 18 to 30 years of age plus a certain number of older men from the officer, or noble, class. This age and sex group usually included about ten per cent of the total population. The core of Aztec military power lay in the capital, Tezcoco, the valley of Mexico and adjacent portions of the modern states of Mexico, Hidalgo, Puebla, Guerrero and Morelos. Hence in the latter half of the fifteenth century this central region may have had a population of one million. Another million should be added to account for partially conquered tribes and hostile nations such as the Tlaxcaltecs, Tarascans, Huastecs, Totonacs, Mixtecs, Zapotecs and numerous minor linguistic or ethnic groups, thus indicating a total population for all Central Mexico of at least two million, probably more.

The losses incurred by the Central Mexican peoples during the final century before the Spanish Conquest obviously cannot be determined with rigid and formal precision. On the other hand, there is enough available data to furnish a basis for a rational estimate. Most of the principal campaigns from 1415 to 1519 have been recorded although the memory of numerous minor wars, raids and skirmishes must have been lost. For some of the more important battles, actual numerical statements have been given with respect to casualties; for many others an indication of the severity is apparent from the expressions "many killed," "great slaughter," and the like. A literal acceptance of such figures and statements would be unwarranted and much allowance has to be made for the universal tendency toward overstatement for the sake of emphasis. Nevertheless they frequently provide a basis for a fair guess or estimate.

Another point of difficulty is the confusion as to time and place which characterizes the contemporary or later accounts of these operations. In almost every individual instance sources differ with respect to the exact year and exact locale. To attempt a really thorough examination of all details would be a tedious and perhaps impossible task. Therefore in the compilation of campaigns about to be given, there are undoubtedly repetitions, omissions and flat falsities. Despite these acknowledged shortcomings, however, the list is probably reasonably complete and sufficiently accurate to yield a satisfactory over-all survey. The dates are according to the older authorities where available; otherwise I have followed the chronology of Bancroft. The numerical estimates are based where possible on quantitative statements by the Aztec and Spanish historians. The latter are primarily Tezozomoc, Ixtlilxochitl, Durán, Torquemada and Veytia, and in a few cases the *Codex Ramirez* and *Codex Telleriano-Remensis*. Bancroft's account is also very useful although he also necessarily depends upon the sixteenth century authors. In estimating probable casualties, many contributing factors are considered, such as relative size of armies, intensity of battles, importance of the occasions as gauged by the political issues involved, and success of the resistance offered by the enemy. Finally the estimates include casualties on both sides. (See list in Appendix I.)

The total estimated casualties incurred by both sides in the listed wars, raids, and campaigns, including those killed in battle, those who died of wounds and those who as non-combatants were massacred by victorious troops, amount to 288,700 persons. The list given is, however, by no means complete. The tripartite alliance must have participated in dozens of minor and small-scale conflicts which were too insignificant to merit permanent record in tradition or in written script. Particularly must this have been true during the confused final fifty years of Aztec domination. To account for these as a whole it will therefore be legitimate to increase the estimate by twenty-five per cent, thereby raising it to 360,900. Moreover, during the period while the Aztecs

and their allies were extending their power from Guerrero to Tehuantepec, the other peoples of Central Mexico were by no means at perfect peace with each other. The Nahua groups on the eastern plateau, such as the Tlaxcalans and Hueyozincas, were conducting perpetual if intermittent war with each other. Likewise the peripheral tribes such as the Zapotecs, Mixtecs, Tarascans, Totonacs, etc., were raiding and counterraiding. No one knows the full extent of these hostilities but in the aggregate they must have had an intensity at least one-half that characterizing the operations of the triple alliance. If so, the casualties would have amounted to 180,500. The grand total then would have been 541,400, or, in round numbers, 540,000.

At first glance this appears a very large number, perhaps excessive. But the losses were distributed fairly evenly over somewhat more than a century: 104 years from 1415 to 1519. The annual rate of loss, therefore, would have been about 5,200. The mean population throughout this century was probably between 1,500,000 and 2,500,000, say 2,000,000. The direct annual war losses in population, based on these calculations, were then 0.25 per cent. On the assumption that the basic death rate was 50 per thousand and that the population was 2,000,000, the death rate was increased 5 per cent by warfare.

War and human sacrifice together, according to historical evidence, may have accounted for twenty per cent of the mortality in Central Mexico, or, otherwise expressed, may well have increased the normal mortality by about twenty per cent. The final conclusion is consequently justified that these two factors were an important instrumentality in controlling population increase and maintaining a proper balance between the number of inhabitants and their maximum available economic resources.

Summary

In Central Mexico, immediately prior to the Spanish Conquest, the population was reaching the maximum consistent with the means of subsistence. Simultaneously the intensity of warfare rose steadily and the institution of human sacrifice, which depended for victims largely upon war captives, underwent an almost pathological development. An analysis of contemporary documentary sources reveals that the mean annual number of battle casualties reached approximately 5,000 and the corresponding value for sacrificial victims 15,000 during the last half century of Aztec domination. Assuming a probable final population for the area of at least 2,000,000, and a normal death rate of 50 per thousand, the effect of warfare and sacrifice would have been very effective in checking an undue increase in numbers. The suggestion is advanced that these methods may have been developed as a group, or social, response to the need for population limitation.

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Appendix I

Campaigns and estimated battle casualties

1415-1420	War between the Tepanecs of Atzcapotazalco plus the Aztecs against Tezcoco. Five campaigns	34,000
1425-1428	War between the allies (Mexico and Tezcoco) and the Tepanecs. Resulted in the formation of the triple alliance	22,000
1430	Allies against Huexotla, Coatlichan and eight other towns	4,000
1432	Aztecs against Coyuhuacan and two other towns	1,000
1434	Aztecs against Quautitlan and Tultitlan	1,000
1434	Aztecs against Xochimilco and Cuitlahuac	1,100
1435	Aztecs against Quanhuahuac	1,000
1443	Aztecs against Chalco	2,000
1443	Revolt of Tlatelulco	500
1443	Revolt of Tulancingo	500
1448	Allies against Cohuixco and Mazatlan	500
1457-8	Allies against the Mixteca, two invasions	20,000
1458-9	Aztecs against Cozamoloapan and Quauhtochco	2,000
1457-9	Allies against the Totonacs	3,000
1459	Aztecs against Chalco	5,000
1460	Allies against the Huasteca	3,000
1460	Allies against Tepeaca, Quautinchan, Acatzingo	2,000
1467	Tezcoco against Zumpango	500
1468	Aztecs against Hueyozingo and Atlixco	1,000
1469	Allies against Tehuantepec	5,000
1472	Aztecs against Xuchitepec	500
1473	Revolt of Tlatelulco	1,500
1474	Allies against Matlazincas	3,000
1476	Allies against Tarascans	25,000
1476	Aztecs against Tliliuquitepec	300
1480	Aztecs against Meztitlan	500
1481	Allies against Cuextlan	2,000
1483	Aztecs against Tlaxotepec	300
1483	Tezcoco against Hueyozingo	2,000
1486	Allies against various peoples, including Xiquipilco, the Tzuicoacas and Tocpenecas of Jalisco, the Zapotecs, Nauhtlan and Tlacopan	2,000
1488	Aztecs against Chinantla and Cinacantlan	1,000
1489	Tlacopan against Cuextlan	500
1489	Allies against four towns on southern coast	1,000
1490	Aztecs against Quautla (Cuextlan)	500
1490	Allies against Hueyozingo	500
1491	Allies against Huastecs and Totonecs	2,000
1491	Cholula against Tepeaca	1,000
1491	Aztecs against Oztoman and other towns in Guerrero	10,000
1495	Allies against Mazatecs and Zapotecs (Tehuantepec)	40,000
1498	Aztecs against Atlixco	500
1500	Allies against towns of Cuextlan and the Huesteca	1,000
1503	Aztecs against Nopallan, Icpatepec and three others	2,000
1503	Mexico, Hueyozingo and Cholula against Tlaxcala	10,000
1506	Allies against the Mixteca. Destroyed Yanhuitlan, Tlaxiaco, Zozolan	20,000
1506	Aztecs against Iztitlan	1,000
1506	Aztecs against Atlixco and Hueyozingo	1,000
1506	Aztecs against Tetutepec and Quetzaltepec	1,000
1507	Aztecs against Hueyozingo or Cholula	10,000
1509	Aztecs against Amatlan	500
1511	Tezcoco against Tlaxcala	2,000
1512	Aztecs against Tlaxiaco	2,000
1512	Aztecs against Xuchitepec and Icpatepec	1,000
1512	Aztecs against Malinaltepec and Izquixchitlan	1,000
1512	Aztecs against Hueyozingo and Atlixco	500
1513	Aztecs against Yopizincas	500
1512-1515	Numerous raids and campaigns. Indistinguishable in detail. Places vary according to account. Places mentioned: Quetzalapan, Quimichintepec, Nopala, Tututepec (Northeast of Mexico), Tutupepec (on the south coast), Itzlaquetaloca, Mictlanzingo, Xaltianquizco, Icpaltepec, Quetzaltepec, Cihuapohualoyan, Cuexcomaxtlahuacan	25,000
1517	Mexico against northern Culhuas	1,000
1517	Aztecs against Tarascans	2,000
1517-1519	Allies against Tlaxcala	5,000
1517-1519	Allies against numerous revolting provinces. Matztitecas and Zapotecs mentioned	2,000

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